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Nonvital Root Canal Treatment of Necrotic Maxillary Left Lateral Incisor: A Case Report

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ABSTRACT

A dental fracture or cracked tooth is a break or crack of a tooth fragment which is usually caused by traumatic injuries or attack. Traumatic injuries to the tooth can affect the pulp so that the tooth becomes necrosis (nonvital). Root treatment is one of the treatments for pulp disease by removal of the pulp from the root canal and filling the canal with obturation material. The goal is to prevent transmission of the pulp to the periapical tissue, or if it has occurred, to alter or return the periapical tissue to its normal state. This case report discusses root canal treatment of a nonvital tooth in a 31 years old female patient with fracture tooth. The treatment plan is root canal treatment which consists of three main stages that are biomechanical preparation of the root canal, root sterilization with calcium hydroxide, and obturation. Obturation of the root canal using lateral condensation technique with gutta percha material and endomethasone sealer. The success of root treatment requires knowledge of the root canal and the quality of obturation as well as the final restoration.

Keywords: Root canal treatment, fracture, calcium hydroxide, nonvital

INTRODUCTION

A dental fracture or cracked tooth according to the American Dental Association (ADA), is a break or crack of a tooth fragment which is usually caused by traumatic injuries or attack. Tooth fracture usually occurred from mild (involving *chipping* of the outer tooth layers called enamel and dentin) to severe (involving vertical, diagonal, or horizontal fractures of the root). Dental trauma can involve the pulp so that the tooth becomes necrosis (nonvital) (Walton and Torabinejad, 1996)

A nonvital tooth or pulp necrosis or pulp tissue death is an irreversible condition characterized by destruction of the pulp tissue (Widyastuti and Suparno, 2019). Pulp necrosis can be partial or complete. Pulp necrosis is caused by bacterial infection at the pulp. Pulp necrosis can also result from a traumatic injury in which the pulp is damaged before an inflammatory reaction occurs. This condition causes ischemic infarction development and a necrotic pulp with dry gangrene. Necrosis that occurs due to dental trauma usually occurs in a short time or a few weeks. Basically the process is the same, namely there is a change in blood circulation in the pulp which ultimately causes pulp necrosis (Grossmann et al, 1995)

Root canal treatment is one of the treatments for pulp disease by removing vital or necrotic pulp from the root canal and replacing it with a filling material. The goal is to prevent the extension of disease from the pulp to the periapical tissue, or if it has occurred, to change or return the periapical tissue to a normal state (widyastuti, 2017)

Root canal treatment can be divided into three stages, there are biomechanical preparation of the root canal (cleaning and shaping), sterilization and obturation of the root canal. Biomechanical preparation is the removal of pulp tissue by extirpation of vital and necrotic tissue. The ideal root canal preparation includes 4 stages, there are determining the direction of the root canal, cleaning the root canal, shaping the root canal and preparing the apical area. This step is followed by instrumentation, irrigation and sterilization of the root canal and obturation (Nisa et al, 2013).

Hermetic root canal obturation is the main requirement for successful root canal treatment, this can be achieved if the root canal is prepared and sterilized properly. The idea of obturation is to prevent the entry of microorganisms into the root canal through the coronal, prevent the multiplication

of microorganisms that are left behind, prevent the entry of tissue fluid into the pulp through the apical foramen because it can be a medium for bacterial growth(Soedjono et al, 2019)

CASE PRESENTATION

A 31 years old female patient presented with a complaint of a fracture front tooth since 2 years ago due to an accident, currently the patient does not complain of pain in her teeth and the tooth has never been treated. The patient had no suspected systemic history and did not have any allergies to food, drugs or weather.

Extraoral examination revealed no abnormalities. Intraoral examination revealed the presence of 22 teeth fractured in the incisal, sound (-), percussion (-), palpation (-), vitality (-) with OHI 1 (good) (fig. 1a, 1b). The periapical radiograph revealed a horizontal fracture of 1/2 crown on tooth 22 (fig. 2).

(a) (b)

Figure 1. a). Clinical features of the 22 labial teeth; **b).** Clinical features of the 22 palatal teeth

Figure 2. Radiographic image of 22 horizontal fractures of 1/2 crown

DIAGNOSIS AND ETIOLOGY

The diagnosis of tooth 22 was Ellis Class IV fracture with pulp necrosis. The treatment plan is root canal treatment. Dental trauma cause pulp necrosis in several weeks. Pulp necrosis basically occurs due to changes in blood circulation in the pulp which ultimately leads to pulp necrosis. Dental trauma can cause obstruction of the main blood vessels at the apex and subsequently result in dilatation of the capillaries in the pulp. Pulp capillary dilatation is followed by capillary degeneration and then pulp edema, lack of collateral circulation in the pulp, partial or total ischemia of the pulp and cause the pulp response to inflammation is low. This allows bacteria to penetrate into the small blood vessels at the apex. All of these processes can lead to pulp necrosis.

TREATMENT AND RESULTS

The first visit begins by explaining about the condition of the patient teeth and the plan treatment and the treatment duration. After the patient agreed and signed the informed consent, it was followed by a periapical X-ray of tooth 22 to measure the estimated working length on the X-ray.

The second visit is root canal preparation. The first step is to prepare tools and materials. Isolate the work area with a rubber dam (fig. 3a), then widen the canal so that the instrument can enter

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without a hitch with a round diamond bur (fig. 3b), looking for orifices using a smooth broach, take pulp tissue (pulp debridement) using a barbed broach until the canal is really clean. The root canals were irrigated using 2.5% Sodium Hypocrolite (NaOCL) and dried using a sterile paper point.

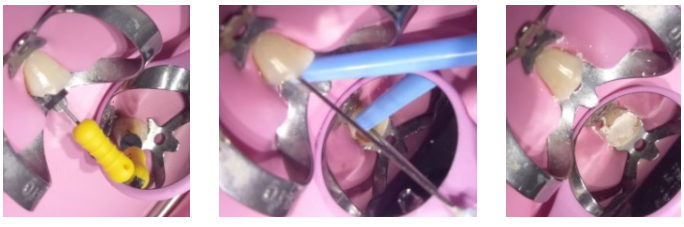
(a) (b)

Figure 3. a). Isolate the work area with a rubber dam; **b).** after widening the canal with a round diamond bur.

The working length is measured by estimating the working length of the radiograph to be confirmed using a k-file inserted along the estimated working length, then a periapical x-radiograph was performed and the working length was 19.5 mm (figure 4).

Figure 4. Radiographic measurement of working length

After getting the working length, the root canal preparation was done with the step back method, starting with the determination of the initial file (IAF #20) followed by apical preparation to obtain the master apical file (MAF #35) and preparation of the root canal body (fig. 5a). Every change of file, root canals were irrigated with 2.5% Sodium Hypocrolite (NaOCl) solution (fig. 5b). Root canal dressing was performed using calcium hydroxide paste + glycerin iodine, inserted with a lentulo with a low speed handpiece until the root canal was completely filled and then filled with cavit temporary filling material (figure 5c).



(a) (b) (c)

Figure 5. a). root canal preparation; **b).** irrigation using 2.5% NaOCl. ; **c).** temporary filling with cavit.

The patient came one week later to continue treatment. The patient had no complaints and the bacterial test using Hydrogen Peroxide (H2O2) was negative. Subjective and objective examination was done. Then, radiograph examination was done for the measurement of the Master Apical Cone

(MAC) using gutta percha according to the length of the Master Apical File (MAF) (fig. 6). Then, obturation of the root canal using gutta percha and endomethasone sealer with lateral condensation technique (MAC #35) (fig. 7a). The gutta percha was inserted into the canal until hermetic and radiograph was performed to determine the obturation result (fig. 7b). After the obturation results were declared hermetic, the excess gutta-percha was cut with a plugger that was heated to the extent of the orifice, temporarily filled with Zinc Phosphate (figure 7c).

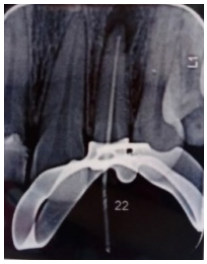
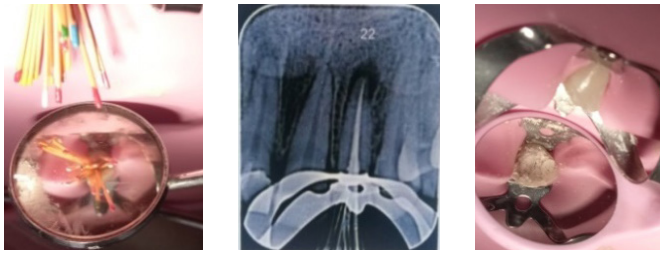
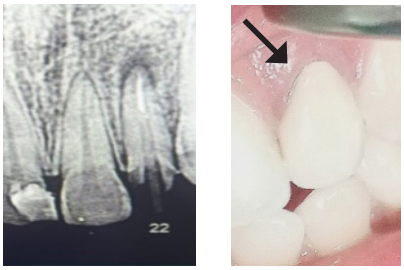


Figure 6. MAC Measurement



(a) (b) (c)

Figure 7. **a)**. root filling. ; **b)**. Radiograph of the results of the obturation. ; **c)**. Temporary filling results with Zinc Phosphate



(a) (b)

Figure 8. **a)**. Photographic try-in fiber post. ; **b)**. The final result of the jacket crown restoration

The patient came one week later to determine the success of the treatment. We performed subjective and objective examination of the patient and the result was that the patient had no complaints, percussion (-) and palpation (-) and the temporary filling was still in good condition. The final restoration in this treatment was a porcelain fused to metal jacket crown with Fiber Reinforced Composites post core retention (Figs 8a, 8b).

DISCUSSION

Treatment on tooth 22 diagnosed with Class IV Ellis Fracture with pulp necrosis has been successfully carried out with nonvital root canal treatment. The necrosis tooth occurred due to a

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fracture that has reached the pulp. Periapical radiographs showed periapical lesions which indicated that the tooth was necrotic, so root canal treatment of nonvital teeth was the most appropriate treatment option for this case.

Root canal preparation is one of the most important parts of root canal treatment. In root canal preparation, it is the process of cleaning and shaping the root canal. The preparation technique used is the step back technique starting from the apical preparation then proceeding towards the corona. The advantage of using the step back technique is that it is more effective in cleaning the root canal, makes obturation easier and the filling is denser because the spreader can penetrate close to the apex (Widastuti, 2017)

Root canal preparation will not be complete without irrigation. NaOCl is the most commonly used irrigating agent today. In the root canal irrigation procedure, NaOCl will dissolve the collagen in the root canal dentin so that it is easy to prepare. Its antibacterial action is obtained in several ways, including by releasing free oxygen which combines with protoplasmic cells so as to damage the cells, the combination of Cl2 with cell membranes to form N-chlorocompound which will interfere with cell metabolism, and mechanical damage to cells by Cl2 and Cl2 oxidation in enzymes so it inhibits enzymes work and result in the death of microorganisms (Mulyawati, 2011).

The use of calcium hydroxide $Ca(OH)_2$ as a sterilization material in root canal treatment has been around for a long time. $Ca(OH)_2$ is an effective root canal medicament because it has broad-spectrum antibacterial properties, is biocompatible with tissues, reduces periapical tissue inflammation, and can stimulate hard tissue formation. $Ca(OH)_2$ has a working action through the release of $Ca^2{}_2$ ions which play a role in the process of tissue mineralization and OH_2 ions which can provide an antimicrobial effect through increasing pH, thus forming an alkaline environment that is not suitable for the development of microorganisms (Ingle,2002). When applied in root canals, $Ca(OH)_2$ decomposes into $Ca^2{}_2$ ions and OH_2 ions which will then diffuse through the dentinal tubules. With its alkaline nature, most of the microorganisms present in infected root canals cannot survive(Ariani and Hadriyanto, 2013).

Root canal obturation is a key principle of endodontic triad treatment. Obturation is the final step after the procedure of removing infected tissue from the root canal and sterilization, and forming the pulp chamber. The choice of root canal obturation material is one of the important factors in determining the success of endodontic treatment. Gutta percha is the most commonly used core material. The advantages of using gutta-percha are that it is plastic, easy to manipulate, has minimal toxic effects, is radiopaque and is easily removed by heat or solution (Mardewi, 2009).

The success of root canal treatment is a good achievement in the treatment according to the specified criteria. For teeth that have been necrotic, the success of root canal treatment is to remove bacteria in the root canal so that the resulting periradicular lesions can recover. Endodontic treatment is said to be successful if there are no complaints and the teeth are functional. The criteria for success in general include no pain or swelling in the treated tooth, no clinical symptoms and the tooth can return to physiological function and the radiograph features in the apex area normal(Zaleckiene, 2014).

CONCLUSION

Pulp necrosis that occurred in the upper left lateral incisor in this case was treated with a nonvital root canal treatment. After being treated with an evaluation for 1 week, the patient stated that there were no complaints about the treatment, objective examination found temporary fillings in good condition, no swelling, percussion (-), palpation (-) thus indicating that the root canal treatment had been successful. However, further evaluation still needs to be done.

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