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Management Of Root Canal Treatment In Tooth Pulp Necrosis 25 With Lacerated Roots *(Case Report)*

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Abstract

Root canal treatment is an action carried out by removing pulp tissue, both vital and necrotic from the root canal, followed by filling using materials that are suitable for the purpose of cleaning the root canal from necrotic tissue and microorganisms from the root canal. In this case, the final restoration used is a porcelain-fused-to-metal (PFM) crown supported by a fiber core and pegs that can increase resistance to fracture in the tooth after endodontic treatment. A 39-year-old man complained of hollowed left upper back teeth. The patient said that the complaint was felt since 3 years ago in the upper left tooth, there was no pain until the time of examination, food was often tucked and the patient had never done treatment on the tooth. The treatment plan to be carried out is root canal treatment with restoration of the crown of the jacket with fiber pegs in the root canal in the case of tooth pulp necrosis 25 with lacerated roots. The three main stages in root canal treatment are known as the endodontic triad, namely biomechanical preparation, sterilization, and hermetic root canal obturation. The purpose of root canal treatment is to eliminate pathogenic microorganisms and infected pulp tissue from within the root canal, prevent the formation of toxic products, as well as protect periapical tissue.

Keywords: ***Root canal treatment, Crown jacket with FRC pegs, Crowndown technique, Lacerated.***

INTRODUCTION

Caries or cavities that are not treated can develop into pulp necrosis. This condition is the final stage of pulpitis which begins with caries, characterized by a cessation of blood supply to the pulp tissue so that the teeth become non-vital. Teeth with abnormalities in the pulp and periodontal tissue are one of the indications for endodontic treatment, especially root canal treatment (PSA). Root canal treatment is an action carried out by removing pulp tissue, both vital and necrotic from the root canal, then followed by filling using appropriate materials. This root canal treatment aims to clean the root canal from necrotic tissue and microorganisms from the root canal.

Root canal treatment (PSA) is an important measure to maintain teeth that experience irreversible pulpitis and pulp necrosis. In general, root canal treatment is carried out in several visits to ensure effective disinfection as well as elimination of infections in the root canal system. Post-root canal treatment teeth become more vulnerable due to reduced dentin tissue in the crown and root canal, which leads to changes in the composition of the tooth structure. Loss of tooth structure due to treatment procedures can reduce hardness by about 5%, while loss of crown tissue can reduce flexibility by up to 60%. Therefore, adequate restoration is needed to protect the occlusal surface and replace the missing protrusions, so as to be able to maintain the strength and structural integrity of the dental crown. In general, restoration techniques are divided into three, namely direct, semi-direct, and indiline techniques. The selection of restoration techniques is determined by the area and location of the existing cavity.

Teeth after endodontic treatment showed changes in biomechanical properties due to loss of hard tissue structure, extensive caries, fractures, and cavity preparation. The use of pegs is indicated in cases with significant loss of crown structure to improve retention and aid in load distribution, particularly in premolar teeth. Final restoration plays an important role in the success of the treatment, with the criteria being able to protect the occlusal surface, replace the missing structure, and have adequate retention and resistance to chewing forces. Porcelain-fused-to-metal (PFM) crowns are one of the restoration options that can restore function, protect the rest of the tooth structure, and provide

good aesthetic results. The use of PFM crowns supported by fiber cores and pegs can increase the resistance to fracture in teeth after endodontic treatment.

RESEARCH METHODS

Research Design

This study uses a *case report* design that aims to comprehensively describe the diagnosis process, surgical management, and histopathological confirmation in cases of radicular cysts associated with radix gangrene.

Research Subject

The subject of the study was a 48-year-old male patient who came to Soelastri Dental and Oral Hospital (RSGM Soelastri), Surakarta, with complaints of root residue in the posterior region of the left mandible. The patient had no history of systemic disease (ASA I) and had an active smoking habit.

Inspection Procedure

The examination was carried out through anamnesis, extraoral and intraoral clinical examinations, and radiographic examination using panoramic radiography. Interim diagnosis is established based on the integration of clinical and radiographic findings, taking into account the diagnosis of disparities such as periapical granulomas and residual cysts.

Surgical Procedure

The surgical procedure is performed in a single surgical session under local anesthesia through an inferior alveolar nerve block followed by additional infiltration. A triangular mukoperiosteal flap (Neumann) was performed, followed by an osteotomy to open access to the lesion. The remaining roots are extracted and the cyst is thoroughly nucleated, then curettage of the bone cavity and bone smoothing is performed. Bone defects are treated with the application of collagen sponges, and wounds are closed using simple interrupted suture techniques.

Histopathological Examination

The ennucleated specimen was fixed in a 10% formalin solution and sent to the anatomical pathology laboratory for histopathological examination using hematoxilin-eosin (H&E) staining to establish a definitive diagnosis.

Post-Operative Care and Ethics

Patients were given postoperative antibiotic and analgesic therapy and a two-week follow-up was carried out for wound healing evaluation. Follow-up is planned to monitor bone regeneration and possible recurrence. This research has obtained ethical approval as well as informed consent from patients for medical procedures and scientific publications.

RESULTS AND DISCUSSION

Case Reports

A 39-year-old man came to the Soelastri Dental and Oral Hospital of the University of Muhammadiyah Surakarta complaining that his left upper back teeth were hollow. The patient said that the complaint was felt since 3 years ago in the upper left tooth, there was no pain until the time of examination, food was often tucked and the patient had never done treatment on the tooth. On intraoral examination, there is a cavity in the occlusal part extending to the entire surface of the tooth with sondation (-), percussion (-), palpation (-), CE (-), EPT= 41. On the examination supporting periapical radiography, it appears that the cavity has reached tooth pulp 25. Based on subjective and objective examinations and supporting examinations, the diagnosis of the complaint is pulp necrosis in teeth 25. The treatment plan to be carried out is root canal treatment with restoration of the crown of the jacket with fiber pegs in the root canal lacerated in the case of tooth pulp necrosis 25.

Figure 1. Intraoral photo of the patient before treatment on 25 teeth

Root canal treatment with crown restoration of the jacket with fiber pegs is carried out with the patient's consent through *informed consent*. The patient comes at the first visit to carry out a complete examination, take X-rays on the 25th tooth and provide an explanation to the patient regarding the procedure to be carried out. Then on the second visit, open access was carried out in 25th gear. Dental caries are cleaned using an excavator and a round metal bur. Furthermore, open access is carried out using endo access bur until an orifice is found, then the pulp roof is widened using diamendo bur. Exploration/search for orifice entrances to root canals were carried out using miller needles or *smooth broach*. Root channel exploration begins with the smallest K-file (Dentsplay) number #10 with stopper as per PK estimate. The estimated working length of the diagnosis radiograph was determined by reducing the length of the root canal on the radiography by 1 mm. It was obtained that the estimated PK of the buccal root = 22.5 mm and the estimated PK of the palatal root = 22.5 mm. Pulp extraction of the root canal using *a barbed broach* inserted to a depth of 2/3 of the estimated working length. Debriding action to clean the root canal of necrotic pulp tissue residue in irrigation with *Sodium Hypochlorite* (NaOCl 2.5%), rinsed, saline and dry with paper point (Meta Biomed®). Negotiate the file using k-file (Dentspplay) #8, #10, #15 negotiate until #15 enters, inserts it into the buccal and palatal roots along the 2/3 PK estimate. Irrigated with NaOCl 2.5% 2cc per file change. Coronal *flaring preparation* was carried out on 2/3 of the coronal part of the root canal using *the crown down* technique with a hand use protaper instrument (Dentsplay) with an estimated 2/3 PK. Preparation begins with the SX file with 2/3 PK in *a watch-winding* manner. Each file change, negotiate file #15 along 2/3PK and irrigate with 2.5% NaOCl. Perform a Ro periapical evaluation by entering file #15 with the estimated PK. Irrigation uses endo irrigation syringes with *Sodium Hypochlorite* (NaOCl 2.5%) and saline. Dry using paper point (Meta Biomed®). Root canal medicine by administering medicine using ChKM, by means of a cotton swab that is covered with ChKM and then squeezed and put into the pulp chamber. Next, temporary spacing is carried out using a cavit (caviton®).

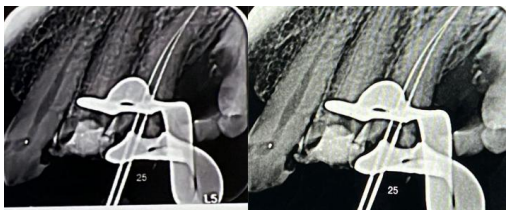

Figure 2. Radiography Evaluation of Working Length Measurement

The third visit, the patient had no complaints and then the temporary demolition of the stack (Caviton®) was carried out. Isolate the work area using a rubberdam (sanctuary dental dam). Apical preparation on the buccal root using *ProTaper Hand Use* (Dentsplay) starts from S1, S2, F1 according to the final working length of 22.5 mm and at the palatal root the preparation starts from S1, S2, F1, F2 according to the final working length of 22.5 mm. Mark the file with a stopper, lubricate with EDTA gel (Biodinamica). Preparation is carried out by *watch winding* movement Every file change, root canal irrigation is carried out with 2cc *Sodium Hypochlorite* (NaOCL 2.5%). Perform an apical foramen examination with K-file (Dentsplay) #20 throughout the PK Final. Try In gutta percha (Meta

Biomed®) *single cone* on the buccal root which is F1 and on the palatal root which is F2. Insert *a single cone* on each root channel according to PK. The correct measurement of the gutta percha single cone is seen from the movement of pushing *the Master Apical Cone* (MAC) which is held at the apical stop, the existence of apical constriction, the existence of *tugback* when pulled there is a hold at 1/3 of the apical. Next, the evaluation of the gutta percha *single cone* using radiography. Administer root canal medication with *calcium hydroxide powder (*$Ca(OH)_2$) at 2/3 of PK. Manipulate until it becomes a paste. Application into the root canal by using lentulo on the wall of the root canal. Next, do a temporary densification using a cavit (caviton®).

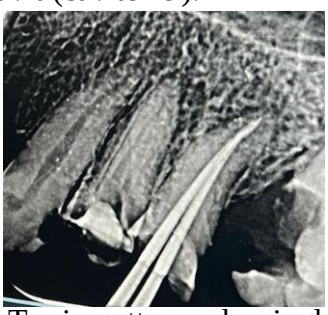

Figure 3. Try in gutta percha single cone on 25 teeth

Fourth visit, the patient said there were no complaints after the previous treatment. An objective examination was carried out on the 25th tooth and it was seen that the lump was not loose, percussion (-), palpation (-). Next, it opens a temporary pile. Insulation of the work area using rubber dam. Irrigation the root canal with NaOCl 2.5% 2cc and saline using an irrigation syringe. The root canal is dried using paper point until dry. A Perhydrol **(**H_2O_2) test is carried out with the last paper point used, then placed on the perhydrol liquid on the glassplate to see if there are bubbles or not. The result is a negative pehydrol test, then the obtuation procedure can be continued. Manipulation of paste sealer in the form of endomethasone (endoseal) and eugenol (camex) ratio 1:1 on glass plate and paper pad with a stainless spatula. The sealer is applied using a lentulo that is given a rubber stop of 2/3 PK. Done until the walls of the root canal are perfectly lubricated. Gutta percha (Meta Biomed®) with the last known file size on the buccal root F1 and on the palatal root F2 is also smeared with a sealer, then inserted into the root canal according to PK. Evaluate with a periapical X-ray to see if the results of the obtuation are hermetic or not. Hermetic results can be obtained by cutting gutta percha. The excess gutta percha is cut up to the orifice with a plugger heated with a spiritus lamp / with a guttap cutter. Doing lining using SIK (GC Gold label) by manipulating SIK type III ratio of powder and liquid 1:1 on a paper pad and stirring with agate spatula until homogeneous. Then apply the lining material on a thin layer of orifice. Temporary cavity clamping in the tooth 25. Evaluation after 1 week.

Figure 4. Obtuation in teeth 25

Fifth visit, the patient said there were no complaints of pain or swelling. Inspection, percussion, palpation and mobility were carried out and the results were negative. Temporary demolition of the pile was carried out with a tip scaler and excavator. Furthermore, for the end of root canal treatment, the chosen is the crown of the jacket with fiber pegs (AAA fiber post). Step One, determine the stake preparation plan. The length of the peg is made along 2/3 of the root canal of the tooth with a clinical crown and the remaining gutta percha is at least 4 mm

Panjang Akar	Panjang Kerja PSA – Panjang Mahkota = 22,5 mm – 7 mm = 15,5 mm
Panjang Pasak	2/3 x Panjang akar (bukal) = 2/3 x 15,5 mm = 10,3 mm
Sisa Gutta Percha	1/3 x Panjang akar = 1/3 x 15,5 mm = 5,1

Table 1. Peg length

The second step is to determine the diameter of the new peg and PK ➔ The diameter of the root canal by measuring the width of the root with an X-ray. The diameter is calculated by the width of 1/3 of the root as the diameter of the peg. Mark the rubber stop according to the new PK (14.9 mm)

Diketahui	• Panjang akar = 15,5 mm • Panjang mahkota = 7 mm • Diameter akar = 4,9
Diameter pasak	1/3 x Diameter akar = 1/3 x 4,9 mm = **1,63 mm**
PK Baru	2/3 P. akar + 2/3 Mahkota = 2/3 x 15,5 mm + 2/3 x 7 mm = 10,3 mm + 4,6 = 14,9

Table 2. New peg and PK diameter

The preparation of the pegs is carried out by removing the lining with a round diamond bur first. The gutta percha is removed using the gates gliden drill and the gutta percha is left with a minimum of 4 mm. Each change of Gates Gliden Drill is irrigated using saline. The preparation of the peg begins with a peeso reamer which has been marked with a rubber stop according to the New Working Length. Preparation begins with peeso reamer No.1 to No. 6 adjusting to the diameter of the root canal (1.63 mm). Irrigation with saline 2 ml. Preparation of the root channel with precision drill according to the diameter of the peg, mark it with a rubber stop. Choose a fiber peg (AAA post fiber) that corresponds to the diameter of the root canal, which is 1.6 mm. The pegs used are blue. Try in pegs according to the diameter and working length, adjust the length with the endoruller. Confirmation is done with radiography to find out if the peg has matched its size and length with the root canal. Next, a cementation was carried out. The peg channels were irrigated with saline and 17% EDTA and drained with paper point (Meta Biomed®). Etching is carried out on all cavities and pegs and let sit for 20 seconds, dried until moist using cotton pellets and paper points. Bonding using a microbrush on the entire cavity and fiber pegs and light cure for 20 seconds. Manipulate the resin cement and insert it into the root canal with a fiber peg inserted into the channel slowly with a circular motion into the root canal, in light cure for 20 seconds. Followed by the core build up using packable composite resin (3M ESPE Filtek Z250). Shaped to resemble a miniature crown of teeth. The length of the core build up is made to be 2/3 of the original crown, made to fit the rest of the crown, then cut the fiber pegs. The results of the core build up are temporarily closed with revotec.

Figure 5. Core build up in 25th gear

The sixth visit is milestone preparation. Color selection is done directly with the light of the room by comparing it with the next tooth using a shade guide. Patient consent is carried out regarding color selection. The color chosen and according to the patient's tooth shade is A3. Next, the gingival

retraction is circular with a retractor thread that has been soaked in epinephrine. Insert it into the subgingiva with a plastic instrument and continue the preparation of the milestone by reducing the occlusal, proximal, axial angle, making a finishing line and doing finishing and polishing. Then tooth printing is done with putty and elastomer with the one-step technique and the teeth are temporarily closed with revotec. The mold is filled with type III stone casts and sent to the laboratory

Figure 6. Preparation of the milestone in the 25th gear

The seventh visit was carried out by try in and semen. First, dismantle the temporary pile with a tip scaler. Clean your teeth using a brush and paste, polish thoroughly, rinse and dry. Gingival retraction with retraction threads that have been soaked in epinephrine. Try in the crown of the jacket, check the adaptation of edges, marginal gaps, color suitability, occlusion and ask the patient subjectively. Cement with resin cement. Insert the crown of the jacket into the teeth, check the adaptation and clean off any excess resin. Irradiate with LC for 20 seconds. Evaluation of semen results after irradiation

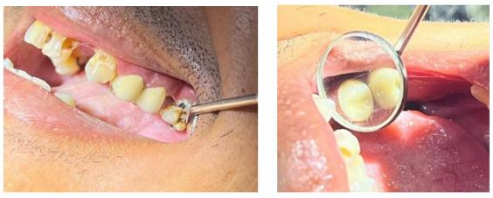

Figure 6. Cementation of the crown of the jacket on the 25th gear

Depth visit is control. The patient feels satisfied and comfortable with the previous installation of the jacket crown. No complaints or pain are felt. A check was also carried out on the interdental part using dental floss and inspection to see if there was any discoloration, damage, adaptation and soft tissue health after the installation of the crown of the jacket and the results were good.

Figure 7. Control 1 week later

Discussion

Dental development anomalies are a set of morphological variations that include deviations in size, shape, and structure from normal conditions. One form of this anomaly is laceration, which is a condition in which there is a bending or deviation in the crown or root of the tooth to its normal axis of length.

According to Santana, Consolaro, and Tavano, lacerated roots are classified based on the size of their angle of curvature into three categories, namely light at 20–40°, medium at 41–60°, and heavy when it reaches ≥61°. The laceration assessment also considers the location of curvature in one-third

of the root, including the cervical, middle, or apical portions, as well as the direction of root deviation such as messal, distal, buccal, and lingual. This disorder is expressed as lasered when there is a root deviation of more than 20° against the axis of tooth length.

Root canal treatment in teeth with laceration can be done using conventional endodontic instruments with adjustment of instrumentation techniques according to the anatomy of the root canal. Root canal treatment is one of the treatment options to maintain teeth for as long as possible in the oral cavity. The goal of root canal treatment is to thoroughly eliminate the contents of the root canal and shape it to allow optimal obtuation with inert materials, thereby preventing necrotic tissue residue as well as the entry of bacteria into the root canal system. The success of treatment is determined by proper diagnosis, adequate planning, and optimal debridement, sterilization, and obturation. In addition, a comprehensive understanding of the anatomical complexities of the root canal is essential to support proper management and improve therapy success.

The three main stages in root canal treatment are known as the endodontic triad, namely biomechanical preparation, sterilization, and hermetic root canal obturation. Preparation is carried out mechanically using instruments combined with chemical irrigation. Irrigation aims to eliminate necrotic tissues, microorganisms, as well as dentin debris during the preparation process. The final stage is obtuation, which is the filling of the root canal that has been prepared and sterilized with filler to achieve optimal filling.

Root canal treatment is declared successful if there are no complaints or pathological abnormalities in the treated teeth. Success criteria include the absence of pain or swelling, the absence of clinical symptoms, and the return of physiological function of the teeth, accompanied by a normal radiographic picture of the apex. In cases with periapical lesions prior to treatment, success is characterized by the absence of complaints of periapical lesions that existed prior to treatment may be reduced or permanent.

CONCLUSION

In general, root canal treatment is carried out in several visits to ensure effective disinfection as well as elimination of infections in the root canal system of the tooth. Porcelain-fused-to-metal (PFM) crowns are one of the restoration options that can restore function, protect the rest of the tooth structure, and provide good aesthetic results. The use of PFM crowns supported by *fiber cores and pegs can increase the resistance to fracture in teeth after endodontic treatment.*

Treatment of the root canal in teeth with laceration can still be performed using conventional endodontic instruments, with modifications of instrumentation techniques adapted to the configuration and anatomy of the root canal. Treatment of lacerated and S-shaped roots is often a challenge in endodontic treatment. Understanding the anatomy of the root canal, coronal preflaring action, precurving of all hand instruments, and the use of small files can help facilitate the negotiation of the root canal curvature and maintain the shape of the canal without causing procedural errors.

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