

ROOT CANAL RETREATMENT FOLLOWED BY ROOT-END RESECTION AND DIRECT VENEER RESTORATION USING RESIN COMPOSITE OF MAXILLARY RIGHT CENTRAL INCISOR

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ABSTRACT

Background: The failure of root canal treatment can cause persistent pain and discolored tooth. Therefore it is recommended to conduct root canal retreatment followed by endodontic surgery and to esthetically restore tooth in order to accomplish satisfactory clinical outcome. The purpose of this case report is to describe the root canal retreatment followed by root-end resection and direct veneer restoration with resin composite of maxillary right central incisor. **Case and treatment:** A 17-year-old male patient was referred for endodontic treatment of his maxillary right central incisor. In the clinical examination, it was observed that the color of tooth was brownish, a defect of enamel with white line on the labial aspect, and a partial detach of resin composite restoration. The tooth was tenderness to percussion, but palpation and mobility were within normal limits. Radiographic examination revealed a lack of hermetic obturation and an apparent radiolucency around the root apex. Root canal retreatment followed by root-end resection was performed. Afterwards, direct veneering with resin composite was carried out to permanently restore the tooth. Recall evaluation was showed that the patient was asymptomatic, periapical lesion disappeared and patient was satisfactory with the restoration. **Conclusion:** It can be concluded that when root canal retreatment is unsuccessful, endodontic surgery is an important treatment option to improve periapical healing and increase the long term success. The choice of aesthetic permanent restoration is also crucial consideration to overcome the unaesthetic problems; hence the optimal treatment outcome can be achieved. *Maj Ked Gi; Juni 2012; 19(1): 53-57*

Key Words: Root canal retreatment, root-end resection, direct veneer.

ABSTRAK

Latar belakang: Kegagalan perawatan saluran akar dapat menyebabkan nyeri yang persisten dan perubahan warna pada gigi. Oleh karena itu dianjurkan untuk dilakukan perawatan ulang saluran akar, diikuti dengan bedah endodontik dan dilakukan restorasi yang estetik sehingga hasil perawatan dapat optimal. Tujuan penulisan artikel ini adalah untuk melaporkan kasus perawatan ulang saluran akar yang diikuti dengan reseksi apeks dan restorasi veneer direk dengan resin komposit pada insisivus sentralis kanan maksila. **Kasus dan penanganannya:** Seorang pasien laki-laki berumur 17 tahun datang dengan keluhan rasa sakit yang terus-menerus dan perubahan warna pada giginya pada gigi insisivus sentral kanan maksila. Pemeriksaan klinis menunjukkan warna gigi kecoklatan, ada kerusakan pada email dengan garis putih pada permukaan labial, dan sebagian restorasi resin komposit telah hilang. Pada pemeriksaan perkusi gigi terasa sakit, pada pemeriksaan palpasi gigi tidak sakit dan tidak ada mobilitas. Pemeriksaan radiografis memperlihatkan bahwa obturasi saluran akar tidak hermetis dan terlihat adanya area radiolusen yang jelas di sekitar apeks akar. Perawatan yang dilakukan pada pasien tersebut adalah perawatan ulang saluran akar, kemudian diikuti reseksi apeks, dan direstorasi secara veneer direk dengan resin komposit. Evaluasi hasil perawatan menunjukkan bahwa pasien tidak merasakan sakit lagi, tidak ada lesi periapikal, dan pasien puas dengan restorasi veneer direk. **Kesimpulan:** Dapat disimpulkan bahwa apabila perawatan ulang saluran akar tidak berhasil, bedah endodontik adalah pilihan perawatan yang tepat untuk mendapatkan penyembuhan lesi periapikal yang optimal dan restorasi estetik merupakan pilihan sehingga keberhasilan jangka panjang dapat dicapai. *Maj Ked Gi; Juni 2012; 19(1): 53-57*

Kata Kunci: Perawatan saluran akar ulang, reseksi apeks, veneer direk.

INTRODUCTION

Endodontic success is obtained through thorough cleaning and shaping followed by hermetic obturation of the root canal system¹. The failure of root canal treatment can cause persistent pain and discolored of teeth. Root canal treatment failures can be attributable to inadequacies in cleaning, shaping and obturation, iatrogenic events, or reinfection of the root canal system when coronal seal is lost after comple-

tion of root canal treatment².

The most frequent reasons of healing failure after root canal treatment are failure to eliminate microorganisms that were present at the time of initial treatment or the reintroduction of microorganisms into the root canal system after the initial treatment was completed. Microorganisms may invade the obturated canal space after treatment, primarily as a result of coronal microleakage. In most cases, microorganisms persist in apical portion of the root canal

system, even in well-treated teeth¹.

Several studies have demonstrated that part of the root canal space often remains untouched during chemomechanical preparation, regardless of the technique and instruments employed. Untouched area may contain bacteria and necrotic tissue substrate even though the root canal filling appears to be radiographically adequate².

Since microorganism can spread and establish in the periapical tissues, as a result they are inaccessible to endodontic disinfection procedures, and periapical infection may be a factor in the failure of root canal treatment⁴.

If non-healing occurs following root canal treatment, the treatments option includes non-surgical retreatment, endodontic surgery, extraction, and in the selected cases is intentional replantation⁵. The retreatment option attempts the clinicians to eliminate any microorganisms that may be have been left behind during the initial treatment, and those microorganisms that may have entered the root canal system after the initial treatment. Retreatment would be the treatment of choice if it were determined that the procedure is feasible since the tooth is restorable, periodontally sound, and the root canal systems are accessible from a non-surgical approach⁵.

Studies have shown that the success rate of root canal retreatment may reach approximately two-thirds of cases⁴, hence, one should try to retreat a failed root canal treatment first, particularly when the previous treatment falls short of the accepted technical standards³. However, when the retreatment fails, the endodontic surgery is indicated for correction. The purpose of endodontic surgery include sealing of all portals of exists to the root canal system, eliminating bacteria and their products from contaminating the periapical tissues, and providing an environment that allows for regeneration of periapical tissues⁶.

One of the consequences of failure of root canal treatment is the change of tooth color (discolored), due to several factors such as intra-pulpal hemorrhage due to trauma, remnants of pulps tissues, obturating materials, and intracanal medications. Discoloration of anterior teeth is a cosmetic problem that is often significant enough to induce patients to seek treatment. Many methods are available to treat or correct discolored teeth, such as crowns, veneers, and bleaching. Even though bleaching is more conservative and good option to treat the endodontically discolored teeth, it has been not suggested if defects occurs in the tooth structures^{7,8}.

The purpose of this case report is to describe the root canal retreatment followed by root-end resection and direct veneering with resin composite of maxillary right central incisor.

CASE REPORT

A 17-year-old male patient was referred to the Prof. Soedomo Dental Hospital at Faculty of Dentistry, Universitas Gadjah Mada for endodontic treatment of his maxillary right central incisor. He complained of a constant throbbing pain in tooth 11 following the partial detach of the restoration approximately a month ago. He also complained that recently the tooth has been changed to brown color. He mentioned that he obtained root canal treatment and resin composite restoration approximately three years ago.

In the clinical examination, it was observed that the color of tooth was brownish, a defect of enamel with white line on the labial aspect occurred. A partial detach of resin composite restoration was also observed, hence the root filling had been exposed to oral environment during this time (Fig.1). The tooth was tenderness to percussion, but palpation and mobility tests were within normal limits. Radiographic examination revealed a lack of hermetic obturation and an apparent radiolucency (approximately 5 mm in diameter) around the root apex (Fig. 2).

The patient was informed that root canal retreatment would be done first, followed by possible endodontic surgery if the failure of retreatment occurred. The patient consented to the treatment plan. After isolation, resin composite restoration was removed and the access cavity was made using access bur (Dentsply-Maillefer, Tulsa, OK, USA) followed by non-cutting end bur (Diamendo, Dentsply-Maillefer). The filling material within root canal was removed using Hedstroem file (Dentsply-Maillefer) size 30, and then the canal was copious irrigated with 2.5% sodium hypochlorite (NaOCl) (Alfa Kimia, Indonesia). The radiographic examination was undertaken to check whether the canal had been free from filling materials. The working length was determined radiographically at 25 mm.

The root canal was conventional prepared using K file (Dentsply-Maillefer) to a size 90. In between and in the end of preparation, root canal was irrigated using 2.5% NaOCl, followed by 17% EDTA ((Largal Ultra, Septodont, Cedex, France), and ended with 2% chlorhexidine gluconate (Bisco, USA). Root canal was dried using sterile paper points (Dentsply-Maillefer). A calcium hydroxide paste (calcium hydroxide powder mixed with saline solution) was applied and the access cavity was temporarily sealed with cavit (3M ESPE AG, Seefeld, Germany)

The patient returned after one week. The temporary restoration and calcium hydroxide paste were removed and the canal was copious irrigated using 2.5% NaOCl, followed by 17% EDTA and finished with 2% chlorhexidine gluconate. The canal was dried using sterile paper points. Afterwards, the root canal was obturated with epoxy resin-based sealer (Topseal, Dentsply-Maillefer) and gutta-percha

(Dentsply-Maillefer) using lateral condensation technique. A radiograph was taken to verify the hermetic of root canal obturation (Fig. 3). The tooth was then temporary restored with glass ionomer cement (Fuji-lining, GC America, Japan) and cavitated.

At the one month follow-up, throbbing pain remain persisted. In clinical examination, the tooth was tenderness to percussion and palpation, but no tooth mobility. Radiolucency of the periapical area was still present and the diameter of periapical lesion did not reduce. Therefore, the patient was prepared for endodontic surgery as the consented treatment planning. After local maxillary infiltration (Pehacain, Phaphros, Semarang, Indonesia), a mucoperiosteal flap was made using scalpel (Fig.4). Periapical lesion was noted at the apex root with cortical bone fenestration. The granulation tissue was curetted (Fig. 5), an osteotomy was carried out and 3 mm of root apex was sectioned using high-speed handpiece fissure bur (Fig. 6). The operation area then was irrigated copiously using saline solution until free of debris. Mineral Trioxide Aggregate (MTA) (ProRoot MTA, Dentsply-Caulk, Milford, DE, USA) was applied to seal the cavity at the root apex. Bone-graph (Batan, Jakarta) was poured into the surrounding area of root apex. Flap closure was obtained with interrupted technique (Fig. 7). Post-operative radiograph were taken to ensure that the periapical lesion had been removed, and the MTA remain in the position (Fig. 8).

The patient returned a week later for follow-up evaluation and suture removal. The tooth was asymptomatic and no inflammation in operation area (Fig. 9). Radiographic examination revealed the diameter of periapical lesion reduced (Fig. 10). Healing of the surgery was uneventful.

At a month later patient came to the clinic for follow-up evaluation and establishment a permanent restoration. The outcome of the treatment was excellent. the patient remained asymptomatic and radiographic examination showed that the radiolucency was disappeared.

Furthermore, patient was arranged for establishment permanent restoration. The first step was to determine the color shade of tooth (A2) before starting the procedures. Temporary restorations as well as the remaining of resin composite restoration were removed using round and fissure burs. Gutta-percha was partially removed (\pm 5 mm) from the orifice using heated plugger, followed by preparation using Peeso reamers ((Dentsply-Maillefer) to remove the filling material at approximately 5 mm from orifice. Continuous ledge was made in pulp chamber wall using fissure bur. The canal and pulp chamber were then etched for 15 sec with 35% phosphoric acid (Dentsply-Caulk), rinse off, bonded and light cured for 20 sec using total etch system (Prime and Bond NT, Dentsply-Caulk). Chemically activated resin composite (Coremax II, Dentsply-Sankin, Japan) was in-

serted to the root canal, followed by light-curing of resin composite (Esthet X HD, Dentsply-Caulk) for 20 sec.

Alginate impression of the tooth was taken, then poured with stone gypsum. The wax mock-up was created in working model to guide the outline form of incise edge, palatal occlusion and proximal contact. The silicone putty was placed over the mock-up and adjacent teeth (Fig. 11). The wax mock-up was then carefully removed from the tooth. The silicone putty impression would be as matrix (Fig. 12) during resin composite application. Labial surface of tooth was grounded (\pm 0.5 mm) using depth cutter bur (Brasseler, USA) to guide the depth of preparation, then the labial surface including cervical area were prepared using round-end tapered fissure without removing the incise edge and proximal contact area. Cavo-surface margin of palatal was also beveled using torpedo bur. Preparation was smoothen using finishing bur. Retraction cord was placed on the cervical area.

The tooth was next etched using 37% phosphoric acid for 15 sec. rinsed off, dried, bonded and light-cured for 10 sec using total-etch bonding system (Prime and Bond NT, Dentsply-Caulk). Furthermore, the silicone putty was then repositioned over the teeth as matrix (Fig. 13). Resin composite (Esthet X HD, Dentsply-Caulk). was applied from palatal to labial aspect using layering technique, with 20 sec-light curing of each layer. Opaque color (A1O) was applied to mask the darkness in the underlying tooth, followed by body, enamel (A2), and cervical color (A2O), and finished with incise color (YE). The restoration was finished using fine and extra fine finishing burs and polished using silicone rubber cup with polishing paste (Prisma Gloss, Dentsply-Caulk) (Fig. 14).

Two weeks later patient returned for recall. The outcome was excellent. the patient remained asymptomatic. The permanent restoration was still in good condition and no traumatic condition. In addition, no chipping or fracture as well as no color change of the restoration, and the gingival and periodontal area was in healthy condition. Patient was satisfactory with the treatment outcome.

DISCUSSION

Non-surgical retreatment is a highly successful procedure if diagnosis and technical aspects are carefully performed. The benefit of retreatment include retention of the patient's natural tooth structure, which can be utilized to restore the tooth to form and function, decreasing the need for a more extensive and possibly more expensive prosthetic replacement if the tooth was to be extracted⁶. However if the root canal retreatment failure and no healing of periapical lesion occur, endodontic surgery is the best treat-

ment of option to improve healing and to achieve long term-success without extracting the tooth ⁴.

In this case, the tooth was treated by endodontic surgery (root-end resected) following failure of root canal retreatment since the patient still suffered from persistent pain and the periapical lesion was still present as the lesion did not reduce in diameter, which it was verified by radiographic examination. The lack of sealing ability of root apex perhaps the main factor of root canal retreatment fails. This is probably because the anaerobe microorganisms, particularly *E. Faecalis*, which is difficult to eradicate, has extremely resistant to several medicaments, including calcium hydroxide ³. These microorganisms can spread to periapical area easily. In addition, since microorganisms established in the perapical tissue area inaccessible to endodontic disinfection procedures, extraradicular infection may be a factor in the failure of root canal retreatment ⁹.

Root-end resection as a treatment option in cases of orthograde endodontic failure, and tooth can be successfully preserved from extraction ⁴. To avoid lack of sealing ability in the root apex area, after root-end resection the resected apex was sealed with Mineral Trioxide Aggregate (MTA), since MTA appears to display a greater sealing capacity over other materials, being more biocompatible, a powerful in antibacterial effect and setting in moisture environment without lost of its properties and it is not resorbable ¹⁰. Therefore, MTA is a material of choice as root-end filling material in this case.

The occurrence of discolored tooth in this case probably the pulp fragments are remaining in the crown and usually in the pulp horn area. This might be during initial root canal treatment the pulp horns was not opened-up and exposed in accessing root canal. The gradual discoloration can occur due to this condition. Obturating material is able to induce discoloration as well. Incomplete removal of material from the pulp chamber on the completion of root canal treatment often results in dark discoloration, particularly sealer containing eugenol. Sealer remnants gradually cause progressive coronal discoloration. To prevent this discoloration, all material of obturation must be removed to a level just cervical to the gingival margin ¹¹. In this case, the zinc oxide-eugenol sealer might be used to obturate the initial root canal treatment, since the filling material in this case was able to be removed easily before starting retreatment. To remove root canal filling material was difficult if the resin-based sealer used in initial root canal treatment.

Intracanal medication, such as iodoform-based can has tendency to discolor the dentin gradually, especially if long period direct contact with dentin occur. Intrapulpal hemorrhage is also able to induce discoloration. Intrapulpal hemorrhage generally is associated with an impact trauma that results in dis-

rupted coronal blood vessels, hemorrhage, and lyses of erythrocytes. The blood contains pigment hemosiderin and iron sulfides, a by-product of hemoglobin, enter the dentinal tubules and stain surrounding dentin ⁸. The discoloration tends to increase with time. All possible causes above probably can induce tooth discoloration in this case.

Chemically activated resin composite was introduced into the canal approximately 5 mm from the orifice to strengthen the tooth after retreatment and root-end resection. This intra-canal restoration can withstand with loading pressure during mastication rather than without intra-canal restoration ¹¹. This type of intra-canal restoration can also avoid the disturbing of the healing process at the periapical area following root-end resection. Additionally, since the patient had edge to edge bite, the loading pressure during mastication is minimal ¹¹. Thus, this type of restoration was selected rather than fabricated post.

To treat the discolored tooth, direct veneer was a restoration of choice rather than bleaching. This is because the enamel defect along with white line on the labial surface occurred on patient's tooth, besides class IV cavity restoration using resin composite that had been previously carried out and partially detached when the patient had come firstly to the clinic. Restoration associated with those unaesthetic problems can be simultaneously overcome in this case by direct veneer with resin composite rather than intra-canal bleaching, because the former can either mask the discolored tooth or restore the class IV cavity. This veneer method has several advantages, namely it can mask dark stains, more conservative (less tooth reduction) than crowning, low cost, less fatigue to the patient and easily manipulated ¹². However, the success of direct veneer using resin composite depends on high skills ability and experience of the clinicians ^{8,12}.

CONCLUSION

It can be concluded that when root canal retreatment is unsuccessful, endodontic surgery is an important treatment option to improve periapical healing and increase the long term success. The choice of aesthetic permanent restoration is also crucial consideration to overcome the unaesthetic problems; hence the optimal treatment outcome can be achieved.

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(1) (2)

Figure 1. Before treatment showed that the tooth color was brownish, defect of enamel with white line and partial detached of resin composite restoration.

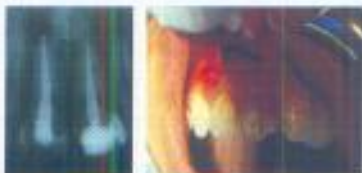
Figure 2. Radiographic examination revealed a lack of hermetic obturation and radiolucency ± 5 mm in diameter in periapical area



(9) (10)

Figure 9. Recall one week post surgery and after suture removal exhibited no inflammation Healing wa uneventful

Figure 10. Radiographic imaging a week post surgery revealed diameter of periapical lesion reduced.



(3) (4)

Figure 3. Root canal obturation

Figure 4. Flap opening



(11) (12)

Figure 11. Silicone putty was placed over the mock-up.

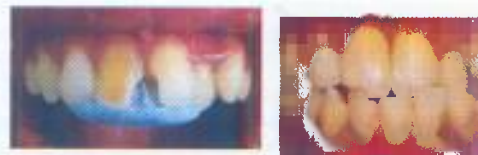
Figure 12. Silicone putty matrix.



(5) (6)

Figure 5. Granulation tissues curettage

Figure 6. Root-end resection



(13) (14)

Figure 13. Putty matrix was positioned over the teeth.

Figure 14. The direct veneer restoration was completed.



(7) (8)

Figure 7. Flap closure with interrupted technique

Figure 8. Post-surgery radiograph