

Orthograde Endodontic Retreatment of Teeth with Individual Cast Posts: Report of Two Cases

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SUMMARY

Introduction The failure of primary endodontic treatment is manifested by various clinical symptoms following endodontic therapy or, more frequently, by the development of chronic inflammatory process in the apex region without any subjective symptoms. In case of unfavorable outcome of the primary endodontic treatment, orthograde endodontic retreatment is the method of choice for a prolonged therapy.

Outline of Cases Two female patients, 47 and 44 years old, were presented at the Dental Clinic of Vojvodina for endodontic retreatment of teeth 22, 23 and 13, within the repeated prosthetic restoration. Intraradicular individual cast posts were removed using ultrasonic instruments. Remains of gutta-percha were removed by engine driven rotary re-treatment files, root canals were shaped and cleaned using the crown-down technique, and obturated with gutta-percha and epoxy-resin-based sealer using the lateral compaction technique.

Conclusion When there are metal posts or broken instruments in the root canal, the use of ultrasonic instruments is considered a safe method characterized by negligible tooth substance loss and minimal root damage causing fractures and perforations, and the entire procedure is effective and predictable. Non-surgical orthograde endodontic retreatment, when properly performed in accessible and penetrable root canals, achieves a high cure rate, good and lasting results and eliminates the need for radical procedures, such as apical surgery or tooth extraction. When nonsurgical endodontic retreatment is done, treated teeth must be restored by full coronal coverage as soon as possible, to prevent coronal leakage or fracture.

Keywords: endodontic retreatment; rotary retreatment endodontic files; individual cast post; ultrasonic endodontic instruments

INTRODUCTION

According to the available literature data the success rates of endodontic treatment range from 70% to 95% [1, 2, 3]. Factors that can affect the endodontic therapy outcome include preoperative pulp condition, root canal anatomy, presence of bacterial infection in the root canal, occurrence and extent of periradicular lesions, shaping and cleaning method, root canal filling level in relation to apical opening, as well as the quality of coronal restoration [4]. In the view of modern approach to the root canal therapy, the instrumentation and obturation of the radicular space must be completed at the level of apical constriction [5]. However, the apical constriction is often hardly accessible, which is due to a curved or complexly shaped root canal, separated instruments, improperly determined working length of the canal and inadequate instrumentation or obliteration of the root canal system [6]. All aforementioned factors significantly contribute to the failure of endodontic treatment manifested by various clinical symptoms following endodontic therapy or, more frequently, by development of chronic inflammatory process in the apical opening region without any subjective symptoms. In such symptomless cases the chronic periapical lesion is mostly diagnosed only

randomly by radiographic image analysis, frequently associated with untreated or inadequately obturated root canal.

In case of unfavorable outcome of the primary endodontic treatment, the following strategies could be considered: repeated endodontic treatment, apical surgery and retrograde obturation, or extraction and intentional tooth replantation [7]. Repeated endodontic treatment or retreatment, if applicable, is the method of choice for a second line intervention. Besides adequate oral hygiene and patient's motivation, the prerequisites for a predictable retreatment outcome include: appropriate periodontal status, unrestricted access to the root canal, patency along the entire length of the root canal and the possibility of coronal reconstruction [8].

Repeated endodontic treatments are frequently needed in clinical practice to restore teeth with different obstructions of the root canal system such as calcifications, separated instrument fragments or presence of intracanal posts in the root canal [9]. A range of instruments and techniques are applied to remove broken instruments or posts from the root canal, including special trepanning drills [10], various ultrasound instruments [11], extractors [12], as well as different accessories such as solvents, chelators, and irrigants [13]. The removal of individual cast posts presents a particular

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problem because of frequent complications, e.g. weakening, perforation or fracture of the remaining root structure [14]. Factors determining the success and predictability of the procedure encompass skill and experience of the dentist, availability of appropriate equipment and instrumentation, length, shape and diameter of the post and type of cement used for fixing the post inside the root canal [7].

The aim of this case report is to present the course and outcome of endodontic retreatment after removal of an individual cast posts object from the root canal.

CASE REPORT 1

A 47-year-old female patient presented at the Department of Restorative Dentistry and Endodontics of the Clinic of Dentistry of Vojvodina for an endodontic retreatment of teeth 22 and 23 within the repeated prosthetic restoration. Anamnestic data revealed a sensation of discomfort and mild pain sensitivity of the second left maxillary incisor during chewing.

Clinical examination revealed moderate percussion sensitivity of both teeth, whereas retroalveolar radiograph revealed „metal-density” shadows corresponding to the individual cast posts and cores and metal-ceramic crowns. Further comprehensive analysis of radiograph using a magnification loupe (×5) demonstrated absence of root canal filling and presence of a clearly margined radiopaque area in the apex region of the second left maxillary incisor. Inadequate root canal obturation not reaching the apical constriction was observed in the apical third of the left maxillary canine tooth (Figure 1a).

CASE REPORT 2

A 44-year-old female patient was referred to the Department of Restorative Dentistry and Endodontics for endodontic retreatment of the maxillary right canine.

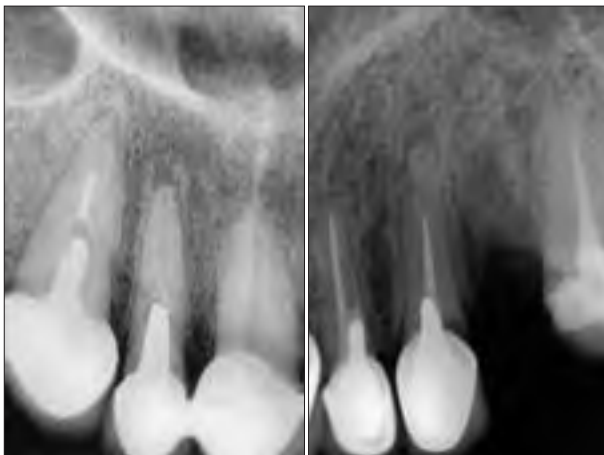


Figure 1a-b. Retroalveolar radiographs revealed „metal-density” shadows corresponding to the individual cast posts and cores and metal-ceramic crowns. Note the absence of root canal filling and presence of clearly margined radiopaque area in the apex region of the second left maxillary incisor and inadequate root canal obturation not reaching the apical constriction in the apical third of the left and right maxillary canines.

Radiographic examination showed the presence of inadequate filling of the root canal with individual post and core that demanded repeated prosthetic restoration (Figure 1b).

After establishing the diagnosis and indications for endodontic retreatment the removal of metal-ceramic crowns and part of individual cast posts was carried out, assuring to preserve a sufficiently long portion of post extending from the root canal. Removal of individual cast posts from the root canals was carried out using an ultrasonic scaler Mini-Master Piezon (EMS–Electro Medical Systems SA, Switzerland) equipped with „dry work” hand pieces. During the first stage, to remove visible cement portion around the cone, a special hand piece was applied (Instrument RT1 part no: DS-066A, EMS – Electro Medical Systems SA, Switzerland), followed by working with the hand piece for the removal of intracanal pins of all kinds (Instrument D part no: DS-005A, EMS – Electro Medical Systems SA, Switzerland) (Figure 2).

Ultrasonic vibrations were applied in all directions related to the longitudinal axis of individual cast posts, continually for maximum 15 seconds to avoid excessive heating of the surrounding dentin. The effect of ultrasonic vibrations on zinc-phosphate cement used for fixing the posts resulted in loosening the intracanal post from the retention cavity thus enabling careful and gentle removal of the intracanal post only by the use of Pean forceps, without rotating movement. The removal of the intracanal posts from the root canals enabled free access to the root canal and endodontic retreatment, which was performed during the same visit.



Figure 2. Ultrasonic scaler Mini-Master Piezon equipped with „dry work” hand piece for removal of intracanal pins of all kinds



Figure 3. D-RaCe retreatment files specially designed for filling removal of the coronal and the middle/apical third of the root canal

A cotton wool ball soaked with eucalyptus oil was placed onto the visible part of gutta-percha in order to soften the cone. After softening time of about 2 minutes the residues of root filling material from the root canal were removed using full-rotation endodontic instruments (*D-RaCe, FKG Dentaire S.A., Chaux-de-Fonds, Switzerland*) (Figure 3). The instruments DR1 and DR2 were used. The retreatment files DR1 (type size 0.30 – Taper 10%, at 1000 rpm) and DR2 (type size 0.25 – taper 4%, at 600 rpm) are designed for filling removal of the coronal third and the middle/apical third of the root canal, respectively. During operation, the debris was periodically removed from the instruments and procedure continued with mild apical pressure until the instrument was completely clear.

After complete removal of gutta-percha working lengths were determined applying an electronic apex-locator (*ProPex II, Dentsply/Maillefer, Ballaigues, Switzerland*), and both root canals were shaped using the crown-down technique [15,16]. Shaping and cleaning of the root canal was performed utilizing the nickel-titanium rotary instrument with greater conicity (*BioRaCe, FKG Dentaire S.A., Chaux-de-Fonds, Switzerland*) applying copious irrigation with sodium-hypochlorite (1%) and lubrication (*Glyde File, DeTrey/Dentsply, Konstanz, Germany*). After drying the root canals with paper points final obturation was performed using gutta-percha points of greater conicity (*Gutta Percha .06 Taper, FKG Dentaire S.A., Chaux-de-Fonds, Switzerland*) and epoxy-resin based paste for permanent obturation (*AH Plus, Dentsply/Maillefer, Ballaigues, Switzerland*), employing the cold lateral-compaction technique.

The control radiography was performed immediately after endodontic retreatment, revealing two homogeneously obturated root canals with apical filling levels corresponding to electronically determined working lengths (Figures 4a and 4b).

DISCUSSION

Non-surgical orthograde endodontic retreatment, when properly performed in accessible and penetrable root

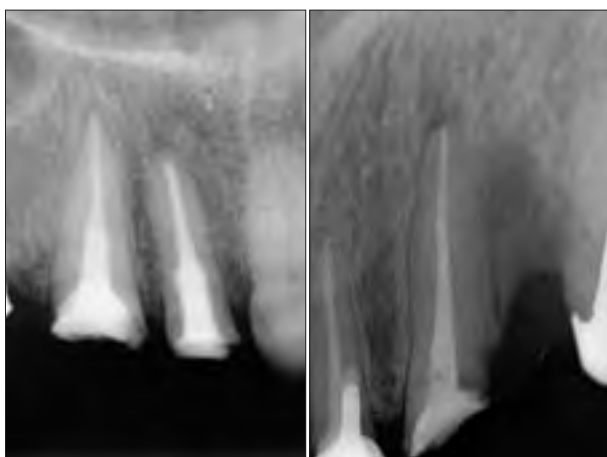


Figure 4a-b. The control radiography shows homogeneously obturated root canals with apical filling levels corresponding to electronically determined working lengths

canals, achieves a high cure rate, good and lasting results and eliminates the need for radical procedures, such as apical surgery or tooth extraction. Contrary to a common clinical practice in our country, where repeated endodontic treatment mostly implies and indicates a retrograde surgical procedure, Pennington's [17] reports based on a comprehensive cost-effectiveness study indicated that, in case of initial endodontic treatment failure, repeated orthograde endodontic treatment and implant replacement should be considered a second and third line intervention, whereas retrograde surgical treatment is not indicated.

When speaking about removal of macro-mechanical retention elements or broken instruments from the root canal application of ultrasound is considered safe method characterized by negligible tooth substance loss and minimal root damage causing fractures and perforations, and the entire procedure is fast, effective and predictable [18]. If the tooth stump is covered with crown, as in the case presented, it must be removed in case of suspect microleakage or recurrent caries. Also, the crown must be displaced to enable unrestricted access to the individual cast post and core. Via the ultrasonic tip vibrations are applied and transferred through the metal post and break the intermediary cement layer fixing the post to the dentin walls of intraradicular retention cavity. The procedure is continued until the post is dislodged from the retention cavity [19]. The uncemented post is then removed from the retention cavity, i.e. root canal, by a straight, non-rotating movement using a pincette or Pean forceps.

The presented method minimizes tooth structure loss and significantly reduces the risk of damaging the remaining tooth tissue [18]. However, thin and fragile ultrasonic instruments should be avoided because of potential breakage, particularly in cases of prolonged usage. Over dimensioned ultrasonic instruments are also inadequate, impeding applications of ultrasonic energy from various directions [9].

Gutta-percha is the most commonly used material for root canal obturation, thus its removal from the canal is most frequently required during repeated endodontic treatment. The removal is performed using hand and/or rotary endodontic instruments, applying heat, ultrasound, solvents and the combination thereof. An effective and less time consuming method, applied in the case presented, is employment of engine-driven rotary endodontic instruments specially designed for endodontic retreatment. The advantage of this method is that apical advancement of the instrument results in evacuation of gutta-percha in a coronal direction; however, it is applicable only in straight portions of the canal, which is the main drawback of this technique. Besides the endodontic instruments, either hand or engine-driven rotary ones, a range of solvents are applied for the removal of gutta-percha residues. Chloroform proved to be the fastest and most effective solvent, yet it is not widely used because of its toxicity and potential carcinogenic effect. Some alternative solvents are halothane, methyl chloroform, xylene, eucalyptus oil, orange oil, carbon disulfide and benzene [7]. It is to be noticed that solvents are only secondary agents intended for softening the

gutta-percha, and complete removal requires appropriate instrumentation [20]. After the removal of post and root filling residues from the canal, and its shaping and cleaning, the root canal can be re-filled.

In order to protect the remaining tooth structure and prevent coronal microleakage a prompt and adequate coronal restoration adjusted to post-therapeutic crown morphology and root system is essential after completed endodontic retreatment.

A comprehensive epidemiological study conducted by Salehrabi [21] in 50 states of the USA encompassed 1,462,936 endodontically treated teeth in 1,126,288 patients. The research revealed that 97% of teeth were retained in the oral cavity after an adequate endodontic treatment, whereas tooth extraction was indicated in only 3% of teeth. Analysis of extracted teeth demonstrated the lack of adequate and prompt coronal restoration in 85% of cases. The most common cause was complete absence or filling or multi-surface amalgam or composite fillings that often underwent fractures.

In the cases presented here prosthetic reconstruction of the second left maxillary incisor and canines were performed immediately after completed root canal filling, which significantly contributed to the successful outcome of endodontic retreatment.

As regards the experience of the clinician as a factor contributing to the quality of endodontic retreatment, if soundly established and defined current principles of endodontics are followed and with an appropriate application of contemporary instrumentation and techniques (as in the case reported) previous experience of the dentist is not to be considered essential for the quality of endodontic retreatment [22].

The presented cases are particularly interesting since the root canal of second left maxillary incisor did not contain root filling, whereas root fillings of the canines did not reach apical constrictions, thus excluding retrograde surgical retreatment as a possible first line intervention.

In conclusion, the presented cases clearly demonstrated that the difficult task of removing individual cast posts could be readily performed with the aid of the ultrasonic device.

ACKNOWLEDGEMENTS

The authors gratefully thank FKG Dentaire S.A., Chaux-de-Fonds, Switzerland, for valuable support.

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Поновно ортоградно ендодонтско лечење зуба с индивидуалним каналним надоградњама – приказ два случаја

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КРАТАК САДРЖАЈ

Увод Код неуспешног примарног ендодонтског лечења поновљена ендодонтска терапија, или ендодонтски ретретман, јесте терапија избора уколико ју је могуће извести. Опструкције канала корена зуба, ако постоје, неопходно је претходно уклонити, како би се неометано приступило каналном простору и применило поновно ендодонтско лечење.

Приказ болесника Две пацијенткиње старости од 47 година и 44 године јавиле су се на Одељење за болести зуба и ендодонцију Клинике за стоматологију Војводине ради уклањања индивидуалних ливених надоградњи и ендодонтског ретретмана зуба 22, 23, односно 13. Надоградње су уклоњене применом ултразвучног апарата и специјалног наставка намењеног у те сврхе. Остаци старог пуњења уклоњени су машинским ендодонтским инструментима пуне ротације, канали корена су обрађени применом тзв. *crowн-down* технике, а оптурација је извршена гутаперка-поенима и пастом за коначну оптурацију на бази епоксидне смоле методом хладне латералне компакције.

Закључак Нехируршки, ортоградни, ендодонтски ретретман, уколико подразумева правилан рад на проходним каналима корена зуба, даје висок проценат излечења, добре и дуготрајне резултате, те нису потребни радикалнији начини лечења, као што су апикална хирургија и вађење зуба. Када се говори о уклањању макромеханичких елемената ретенције из канала корена, сматра се да примена ултразвука представља безбедан начин рада, уз занемарљив губитак зубне супстанце и веома мала оштећења корена зуба, а читав поступак је брз, ефикасан и предвидљив. Најефикаснији и најбржи начин за уклањање гутаперке из канала корена јесте употреба машинских инструмената пуне ротације. Након успешно завршеног ретретмана неопходна је правремена и адекватна коронарна рестаурација, како би се заштитила преостала зубна структура и спречило коронарно микроцурење.

Кључне речи: ендодонтски ретретман; ротирајући ендодонтски инструменти за ретретман; индивидуалне каналне надоградње; ултразвучни ендодонтски инструменти

Примљен • Received: 07/02/2011

Прихваћен • Accepted: 16/06/2011