

Successful treatment of cystic lesion combining Cystectomy, Nonsurgical Endodontics and Vital Pulp Therapy of Mature Permanent Mandibular Molars: a Case Report with 19 Months Follow-Up

Roberta Zamaliauskiene¹, Rita Veberiene²

¹Private practice, Kaunas, Lithuania.

²Department of Dental and Oral Pathology, Lithuanian University of Health Sciences, Kaunas, Lithuania.

Corresponding Author:

Roberta Zamaliauskiene

Eiveniu 2, Kaunas

Lithuania

E-mail: roberta.zamaliauskiene@gmail.com

ABSTRACT

Background: Clinical examination revealed large periapical lesion. Patient was referred for endodontic treatment of right mandibular first and second molars before planned cystectomy. The aim of this case report is to present the clinical approach to preserve healthy pulp tissue by combining nonsurgical root canal treatment and vital pulp therapy for mature mandibular molar.

Methods: A minimally invasive endodontic therapy treatment with combination of nonsurgical root canal treatment and vital pulp therapy was performed. Osteotomies around wisdom teeth were performed, wisdom teeth extracted, and cyst was removed.

Results: At the 19 months follow-up appointment patient had no complaints, radiographically full regeneration of periapical bone was observed.

Conclusions: A minimally invasive endodontic therapy treatment with combination of nonsurgical root canal treatment and vital pulp therapy for mature mandibular molar before a planned cystectomy could be considered as a treatment option showing good long-term results.

Keywords: cystectomy; oral surgery; pulpectomy; pulpotomy; root canal therapy.

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INTRODUCTION

The pivotal concept of minimally invasive endodontics is preservation of the tooth structure and function. One of the main goals of this approach is to avoid unnecessary damage to the tooth and preserve healthy pulp tissue without losing regenerative potential, proprioceptive impulses, and nerve innervation. [1]

In some cases, it may be possible to combine different treatment modalities to achieve optimal results. This is particularly relevant in cases where periapical lesion is observed in the apical region of one root of a multirooted tooth, and the periapical bone of the other root is without changes. The approach demonstrates the potential of minimally invasive endodontics to preserve the natural structure and function of the tooth while also addressing underlying issues such as periapical lesions. By combining different treatments, clinicians can achieve optimal results while minimizing the need for more invasive treatments [2-5].

The aim of this case report is to present the clinical approach to preserve healthy pulp tissue by combining nonsurgical root canal treatment and vital pulp therapy for mature mandibular molar.

CASE DESCRIPTION AND RESULTS

In August 2020, a 15-year-old patient was referred to the Hospital of Lithuanian University of Health Sciences, Kaunas Clinics, Department of Dental and Oral Pathology for endodontic treatment of right mandibular first and second molars before planned cystectomy. A month ago, orthodontic treatment was finished, and patient was referred to the oral and maxillofacial surgeon for third molars extraction. During the radiographic examination, a cystic lesion around the right mandibular first, second and third molars was observed. Root canal therapy should be performed shortly before or during planned surgical treatment [6]. Therefore, before surgery the patient was referred to an endodontist for endodontic treatment planning.

Anamnesis was assessed - patient had no complaints. Clinical examination using periodontal probe, mirror, tweezers, and ethyl chloride spray (Cold Spray - Polydent; Łódź, Poland) revealed no tenderness to percussion and palpation of right mandibular second premolar, first and second molars. Second premolar and second molar were intact, first molar had a filling. Second molar had no reaction, while second

premolar and first molar had normal reaction to cold stimulus testing by ethyl chloride spray (Cold Spray - Polydent). No mobility of the teeth or periodontal pockets were presented. Patient was scanned with PaX-i3D SMART™ (Vatech Co., Ltd.; Hwaseong-si, Gyeonggi-Do, South Korea) cone-beam computed tomography (CBCT) scanner. The exposure values were set at 85 kVp, 4,4 mA, and a voxel size of 0.1 mm. CBCT images were analysed by using the Ez3D Plus 3D CDViewer v. 1.2.6.1 (Vatech Co., Ltd.) software. CBCT showed large periapical lesion surrounding the right mandibular third and second molars, distal root of the first molar and extending below the second premolar. The size of the lesion was measured: 10.4 mm in buccolingual direction, 15.1 mm in height, and 53.5 mm in mesiodistal direction (10.4 × 15.1 × 53.5 mm). Near the second premolar and the mesial root of the first molar, widening of the periodontal fissure is observed - possible changes after orthodontic treatment (Figure 1).

At the first visit, under local anesthesia (Ubistesin™ Forte - 3M ESPE AG; Seefeld, Germany) root canal treatment of the right mandibular second molar was performed. Anesthesia was chosen because of the possibility of the sensibility test false negative response [7], and the possibility of a different pulp conditions in multirooted tooth roots [5]. Procedure was carried out using rubber dam, dental microscope at magnification x12.5 and following European Society of Endodontology (ESE) guidelines [2]. After controlling drainage of pus by suctioning, necrotic pulp was removed. During treatment, canals were irrigated with sodium hypochlorite 2.5% (Chloraxid - PPH Cerkamed Wojciech Pawlowski; Stalowa Wola, Poland), sterile saline solution, ethylenediaminetetraacetic acid (EDTA) 17% (Endo-solution - PPH Cerkamed Wojciech Pawlowski). Working lengths were established at 0.5 resistance based on the electronic apex locator readings (Root ZX - J. Morita Corp.; Tokyo, Japan), instrumentation was done using rotary nickel-titanium files (ProTaper Gold - Dentsply Sirona; York, Pennsylvania, USA). Apexes were closed with 5 mm mineral trioxide aggregate (Syntheos MTA Universal - P. L. Superior Dental Materials GmbH; Hamburg, Germany) (Figure 2). The endodontic cavity was isolated with polytetrafluoroethylene (PTFE) tape and sealed with glass-ionomer cement (Fuji IX, - GC Corporation; Tokyo, Japan). After endodontic therapy, no antibiotics or pain medication were prescribed.

During the second visit, under local anesthesia (Ubistesin™ Forte - 3M ESPE AG) treatment of the right mandibular first molar was performed. Procedure was carried out using rubber dam, dental microscope

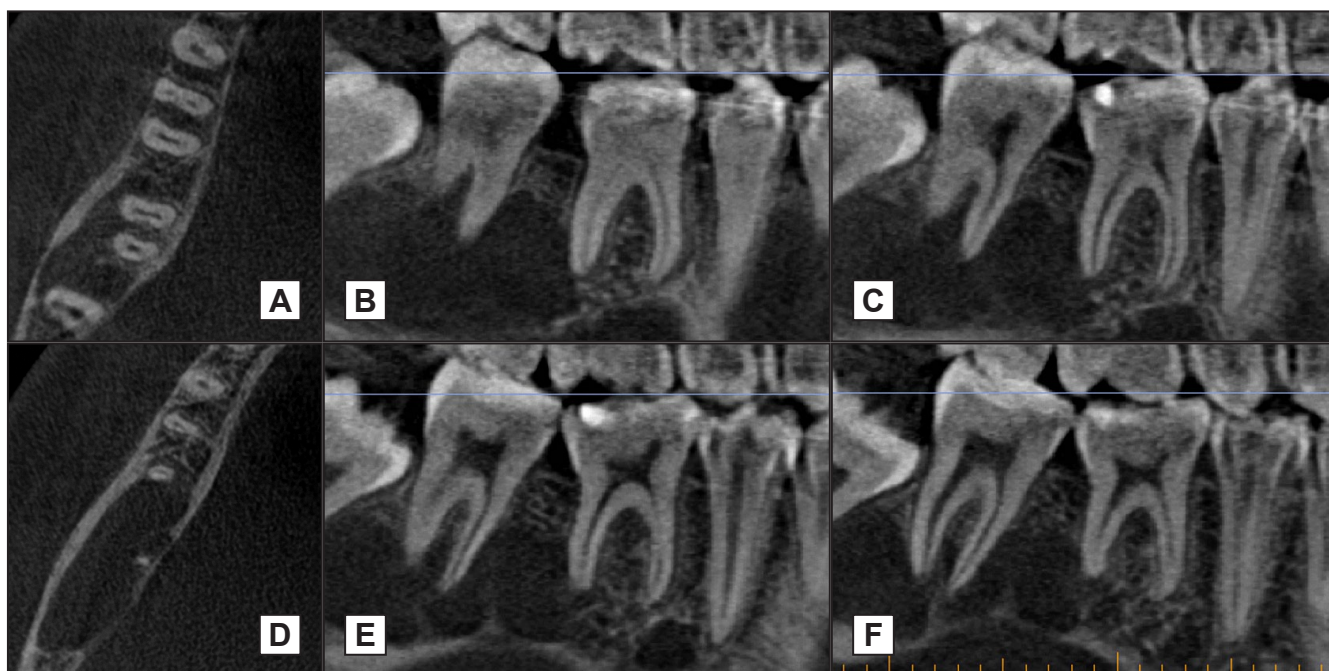


Figure 1. Cone-beam computed tomography axial (A and D) and sagittal (B, C, E, F) planes - large periapical lesion surrounding the right mandibular third and second molars, distal root of the first molar and extending below the second premolar. Size of the lesion: 10.4 mm in buccolingual direction, 15.1 mm in height, and 53.5 mm in mesiodistal direction (10.4 × 15.1 × 53.5 mm).



Figure 2. Operative dental radiograph of the right mandibular second molar.

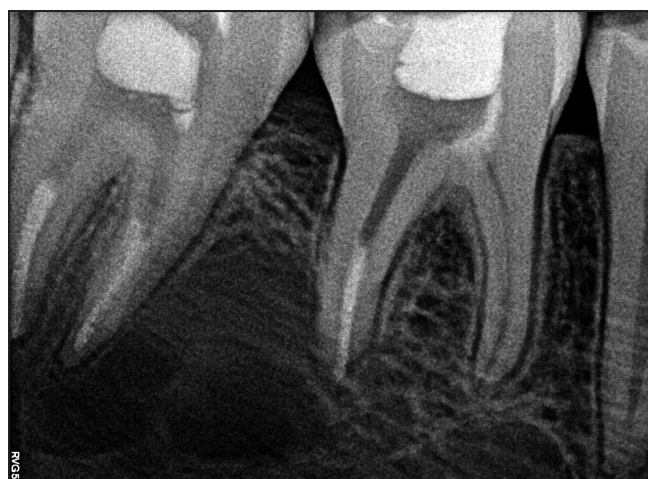


Figure 3. Operative dental radiograph of the right mandibular first molar.

and following ESE guidelines [2]. After exposing pulpal tissue, full pulpotomy was initiated. Using sterile high speed diamond bur, coronal part of pulp tissue was removed to the level of the canal orifices. Endodontic cavity was washed with 2.5% sodium hypochlorite (Chloraxid - PPH Cerkamed Wojciech Pawlowski) and haemostasis of the mesial canals was achieved with an application of a sterile cotton pellet moistened with 2.5% sodium hypochlorite (Chloraxid - PPH Cerkamed Wojciech Pawlowski). After controlling the bleeding (2 min), full pulpotomy of mesial canals was performed using 2 to 3 mm of tricalcium silicate cement (Biodentine™ - Septodont; Saint-Maur-desFossés, France) over the pulp stumps.

As instructed by the manufacturer, after 12 minute waiting for initial setting of the material, liquid rubber dam (Rubber-dam liquid - PPH Cerkamed Wojciech Pawlowski) was placed over the material for temporal isolation. Root canal treatment of distal canal was initiated. During treatment, canal was irrigated with sodium hypochlorite 2.5%, sterile saline solution, EDTA 17%. Working length was established at 0.5 resistance based on the electronic apex locator readings (Root ZX - J. Morita Corp.), instrumentation was done using rotary nickel-titanium files (ProTaper Gold - Dentsply Sirona). Apex was closed with 5 mm mineral trioxide aggregate (Syntheos MTA Universal - P. L. Superior Dental Materials GmbH) (Figure 3).

Liquid rubber dam was removed. The endodontic cavity was isolated with polytetrafluoroethylene (PTFE) tape and sealed with glass-ionomer cement (Fuji IX, - GC Corporation). After endodontic therapy, no antibiotics or pain medication were prescribed.

Upon the third visit, a decreased response to cold stimulus testing (Cold Spray - Polydent) was observed in the right mandibular first molar. In the right mandibular first and second molars hardness of the mineral trioxide aggregate was assessed by dental probe - material was set. The rest of the canal space was filled with thermoplastic gutta-percha and sealer (AH-Plus™ - Dentsply-Maillefer; Ballaigues, Switzerland). The endodontic cavities were isolated with polytetrafluoroethylene (PTFE) tape and sealed with glass-ionomer cement. Panoramic radiograph was performed (Figure 4).

The general dentist restored teeth using composite restorations (Charisma® Smart - Kulzer; Hanau, Germany). After preparative treatment was finished, in 2020 August, patient was hospitalized to the Hospital of Lithuanian University of Health Sciences Kaunas Clinics, Department of Oral and Maxillofacial Surgery for planned surgical removal of wisdom teeth and cystectomy.

After applying general anesthesia (combination of intravenous sedation and inhalation sedation), osteotomies around wisdom teeth were performed, wisdom teeth extracted. Oral and maxillofacial surgeon managed to fully remove cyst without resections and unnecessary damage to the teeth. The alveoli were revised, sutured with resorbable 3-0 suture (Monocryl Suture USP: 3-0, SH length 26 mm - Ethicon Inc.; Bridgewater, New Jersey, USA), tamponed. Antibiotics 1 gram 2 times a day, 6 days (Ospamox - Sandoz Pharmaceuticals GmbH; Holzkirchen, Germany) [8] and pain medication 400 mg 2 times a day, 6 days (Ibuprofen - G.L. Pharma GmbH; Lannach, Austria) were prescribed.

Patient had no complaints after the treatment. At the 6 months follow-up appointment panoramic radiograph was performed - regeneration of periapical bone of the right mandibular first and second molars was observed. Near the second premolar and the mesial root of the first molar, widening of the periodontal fissure remained unchanged. Right mandibular first molar maintained decreased response to cold stimulus testing (Cold Spray - Polydent) (Figure 5).



Figure 4. Panoramic radiograph after endodontic treatment.



Figure 5. Six months follow-up panoramic radiograph.



Figure 6. Nineteen months follow-up panoramic radiograph.

At the 19 months follow-up appointment patient had no complaints, panoramic radiograph was performed - full regeneration of periapical bone of the right second premolar, mandibular first and second molars was observed. Right mandibular first molar maintained decreased response to cold stimulus testing (Cold Spray - Polydent) (Figure 6).

DISCUSSION

Radiolucent lesions in the mandible are not uncommon and may have an odontogenic or non-odontogenic origin [9]. The large majority of these lesions are inflammatory in nature usually are asymptomatic and often are discovered incidentally during routine dental radiographic examination. One of the most important factors generally used for differential diagnosis is the results of pulp sensibility tests. However, the vitality of the pulp is determined by the state of the vascular supply, whereas these pulp tests determine the neural response. Unfortunately, in everyday clinical practice we still do not have a device to objectively measure the vitality of the tooth [7].

In this case necrosis of the right mandibular second molar was possibly caused by blood flow disruption to the pulp tissue, which occurred as a result of the applied orthodontic treatment [10]. It is widely held that large cyst-like periapical lesions caused by root canal infection are less likely to heal after nonsurgical root canal therapy. To achieve satisfactory periapical wound healing, surgical removal of periapical cysts must include root canal infection removal. Root canal therapy should be performed shortly before or during the surgical treatment [6]. The application of a surgical technique should remain as conservative as possible and for this case enucleation with complete removal of the cystic capsule from the

bone was chosen, which was performed successfully without resection of the roots. [11] Unfortunately, no histopathological investigation was performed in this case. Although conventional radiographic methods cannot be used for a certain diagnosis of periapical cysts, Guo et. al. [12] suggested that CBCT images could provide a moderately accurate differentiation between cysts and granulomas if at least four of the six proposed diagnostic criteria for periapical lesions were present. In this case four were observed, including that the lesion was located at the apex of the involved tooth, had a well-defined border, had a radiolucent center, and was a curved shape. Additionally, Pitcher et. al. [13] suggested that there was 80% probability of a cyst if the volume of the lesion was more than 247 mm³, which was also present in this study.

While the effective radiation dose is relatively low, it is still important to use CBCT judiciously, considering the benefits and possible risks. This is especially relevant for children and adolescents, who are more sensitive to the possible effects of ionizing radiation. According to the ESE recommendations [14], CBCT can be performed when dental radiographs do not provide enough information, before surgical treatment, during which large destruction will be removed, and its position is important in relation to adjacent anatomical structures. In this case, in order to clarify the extent of the cyst, involved teeth, planning endodontic treatment and surgical intervention.

In this clinical situation, the choice of treatment for the teeth involved in the cyst is complicated by the recently completed orthodontic treatment, which requires a proper assessment of the widened periodontal fissure near the second premolar and the mesial root of the first molar [10]. Accurate assessment of pulp vitality is a key step for successful diagnosis and management of teeth involved in the cyst. If the tooth is vital, it can be preserved without

endodontic treatment [6]. This minimally invasive approach benefits the patient not only physically, but also financially. In this clinical situation, while planning surgical intervention, assessment of high risk of cutting off the blood supply of the distal root of the right mandibular first molar was made. Therefore, a minimally invasive endodontic treatment was chosen, while maximally preserving the unweakened root structures. After removal of the entire coronal pulp tissue, in the mesial canals pulpotomy of the right mandibular first molar, tricalcium silicate cement (Biodentine, Septodont; Saint-Maur-des-Fossés, France) was applied directly to the healthy, pink pulp tissue on the mesial canal orifices with minimal bleeding [2-4]. Root canal treatment of distal canal was performed. Apex was closed with mineral trioxide aggregate (Syntheos MTA Universal - P. L. Superior Dental Materials GmbH). Different materials were chosen for clinical reasons. To avoid discoloration of the tooth and perform distal root canal treatment in the same visit, non-staining and faster setting tricalcium silicate cement was used. For closing the apex, mineral trioxide aggregate was chosen because it showed a tendency to better outcome results [15]. Combined nonsurgical root canal treatment and vital pulp therapy is also described in the latest literature by Koli et. al. [5]. The treatment can be chosen instead of the usual root canal treatment when, in the case of symptomatic irreversible pulpitis, periapical lesion is observed in the apical region of one root

of a multirrooted tooth, and the periapical bone of the other root is without changes. In the root with periapical lesion, root canal treatment is performed, and in the root without any changes, vital pulp therapy is performed - pulpotomy. Choosing such a treatment method aims to preserve healthy pulp tissue without losing regenerative potential, proprioceptive impulses, and nerve innervation. Teeth that underwent full pulpotomy treatment, despite removal of coronal pulp tissue, can still maintain response to stimulus [16]. In this clinical situation, right mandibular first molar maintained decreased response to cold stimulus testing. Further follow-up is necessary.

CONCLUSIONS

A minimally invasive endodontic therapy treatment with combination of nonsurgical root canal treatment and vital pulp therapy for mature mandibular molar before a planned cystectomy could be considered as a treatment option showing good long-term results.

ACKNOWLEDGMENTS AND DISCLOSURE STATEMENTS

The authors report no conflicts of interest related to this study.

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