

Case Report

Successful management of a tooth with canal obstruction using “cold ceramic”

Jalil Modaresi¹, Zahra Almodaresi², Rahele Mousavi², Alireza Mirzaeeian², Said Abbas Sadat Hosseini³

¹Department of Endodontics, School of Dentistry, Yazd University of Medical Sciences, ²Student Research Committee, School of Dentistry, Yazd University of Medical Sciences, ³Department of Ethics, Yazd University of Medical Sciences, Yazd, Iran

ABSTRACT

One of the causes of treatment failure is calcification in the canal pathway, which prevents complete access to proper working length, and one of the most difficult and challenging cases of root canal treatment has been reported. In some cases, the dentist will not be able to open the calcified canal. Therefore, the prognosis of root canal treatment in these cases has been reported poor, and the dentist will offer a plan for possible treatments, including tooth extraction or apical surgery. The presented case is one example of those cases with a periapical lesion, which as a temporary treatment, the pulp chamber was filled with cold ceramic. This material, which is an MTA-like (Mineral Trioxide Aggregate) bioceramic with proper sealing ability, has been introduced as a root-end filling material. After 6 years of which the patient returned, he did not express any pain or discomfort during these 6 years. Furthermore, in radiograph that was taken, periapical lesion relative healing and bone regeneration were amazingly seen.

Key Words: Ceramics, root canal filling materials, root canal therapy, tooth calcification

Received: 09-Jul-2020
Revised: 01-Oct-2020
Accepted: 17-Mar-2021
Published: 25-Sep-2021

Address for correspondence:
Mr. Alireza Mirzaeeian,
Dental Student,
Student Research
Committee, School of
Dentistry, Yazd University of
Medical Sciences, Yazd, Iran.
E-mail: mirzaeeianalireza@
gmail.com

INTRODUCTION

Periapical lesion with tooth necrosis is an indication of root canal treatment to achieve healing. Complete preparation of the canal with proper working length and adequate debridement of infectious tissue are essential factors to successful root canal treatment. One of the causes of treatment failure is calcification in the canal pathway, which prevents complete access to proper working length, and one of the most difficult and challenging cases of root canal treatment has been reported. Calcification is usually caused by trauma, deep caries, excessive occlusal force, restorations near the pulp, or aging. The dental radiograph shows calcification and complete or partial obstruction of the canal. The skilled dentist will often be able to open the canal pathway with

patience and proper technique. However, in some cases, the dentist will not be able to open the calcified canal. In these cases, the dentist will offer a plan for possible treatments, including tooth extraction or apical surgery.^[1]

Prognosis of root canal treatment in teeth that fail during instrumentation has been reported poor.^[2] Although complete or partial obstruction of the canal path is observed in radiography, according to studies performed on the canal at histologic sections, the calcified canal has microscopic pores that may be a pathway for microbes to enter the periapical tissue.^[3]

Cold ceramic, which is an MTA-like bioceramic, has been introduced as a root-end filling material.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Modaresi J, Almodaresi Z, Mousavi R, Mirzaeeian A, Hosseini SA. Successful management of a tooth with canal obstruction using “cold ceramic”. Dent Res J 2021;18:77.

Access this article online	
	<p>Website: www.drj.ir www.drjjournal.net www.ncbi.nlm.nih.gov/pmc/journals/1480</p>

Its main component is calcium hydroxide.^[4] Cold ceramic is also biocompatible and nontoxic^[5,6] and has acceptable radiopacity.^[7] The sealing ability of this material has been reported more than glass ionomer and amalgam.^[8,9] Cold ceramic when compared to calcium hydroxide is a more resistant material for apical barrier.^[10] One study has shown that the marginal adaptation of cold ceramic is more than MTA in a long time.^[11] This case report presents a central incisor with obstruction of the canal, which has been unusually managed using cold ceramic.

CASE REPORT

A 32-year-old man with a symptomatic maxillary left central incisor came to the private clinic. The patient reported that the incisor had been traumatized previously. The medical history was nonsignificant, and extraoral evaluation revealed normal soft-tissue structures with no apparent pathosis. Upon oral examination, no mobility or probing defect was observed. The tooth was sensitive to percussion and palpation. Furthermore, it responded negatively to vitality tests, and pulp status was diagnosed as necrosis. Radiographic evaluation revealed periapical lesion and bone loss as well as calcification in the canal pathway; it seemed that there was a vertical fracture in the middle of the root that repaired or an abnormal canal [Figure 1]. According to the examinations, the decision was made to the root canal treatment. Following the administration of local anesthesia, attempts were made to prepare the access cavity under an operating microscope. Even the full length of the dental bur was used, but the canal pathway was not found. Tooth maintaining prognosis was decided as hopeless. Anyway, as a temporary treatment, the pulp chamber was filled with cold ceramic. It was prepared according to the manufacturer's instructions and carried to the tooth with MTA carrier. A plugger number 25 (Dentsply, Maillefer, Switzerland) was used for condensing the cold ceramic. Furthermore, the pulp chamber was temporarily restored by Cavit [Figure 2]. The patient was prescribed painkillers and was controlled after 2 weeks of treatment, and he stated that he had no pain after the treatment. He was told that if there was pain or swelling, he should extract the tooth and replace it with an implant. It was recommended that to restore the tooth, as long as it needs to be extracted.



Figure 1: Pre-operative radiograph.



Figure 2: Post-operative radiograph.



Figure 3: Follow-up radiograph.

Follow-up

The patient did not return for control until 6 years later. There was no pain or discomfort in palpation at that time. A radiograph was taken of the tooth, which

displayed amazingly periapical lesion relative healing and bone regeneration [Figure 3].

DISCUSSION

Periapical lesion may occur as a result of pulp tissue inflammation followed by microorganism transmission from the tooth canal to the apical area. It is one of the indications of root canal treatment. Complete preparation of the canal with proper working length and adequate debridement of infectious tissue are essential factors in achieving successful root canal treatment. Failure of root canal treatment can be affected by various factors. Calcification in the canal pathway is one of them, which prevents complete access to proper working length. Calcification is defined as the sedimentation of hard tissue on canal walls or within the pulp as a result of various factors. The most common factor is trauma to the tooth. Other factors can be attributed to deep caries, excessive occlusal forces, restorations near the pulp, or aging.^[1]

The prevalence of calcification is higher in anterior teeth of adults.^[12] According to Holcomb and Gregory study, partial or entire canal calcification prevalence has been reported, 4% for incisors;^[13] this rate reaches 22% in permanent teeth which have been traumatized,^[14] and also the chance of forming a periapical lesion is reported 7%–27% for these teeth.^[15]

It is accepted that teeth with a calcified canal are one of the most difficult cases to treat.^[16] These cases are therapeutic challenges because of the difficulty of canal locating, and the preparation of the access cavity must be minimally invasive. It should keep the risk of iatrogenic injury the lowest possible.^[1] The presented case is an example of a tooth with a calcified canal probably subsequent to trauma, followed by pulp necrosis and periapical lesion, which was a challenge to treatment. It is worth mentioning. Due to the intense radiolucency around the root, there is a possibility of root fracture or root anomaly, which has led to obstruction of the root canal [Figure 1].

Studies show that the use of ultrasonic instruments and dental operating microscopes (DOMs) can help find canal orifice and provide safer access to the pulp space. Further, the use of these devices reduces the risk of iatrogenic injury.^[17] Even with recent advances in the use of ultrasonic instruments and DOMs, treatment of calcified canals is still at high risk of failure.^[18] Only 74% of cases had been reported which successfully treated.^[17] The experienced dentist will

often be able to open the canal pathway with patience and proper technique. However, in some cases, the dentist will not be able to open the calcified canal. In these cases, the dentist will offer a plan for possible treatments, including tooth extraction or apical surgery.^[1] In the presented case, the dentist, despite using a DOM and taking the time, was unable to find the canal orifice. Due to the presence of a periapical lesion and hopeless dental prognosis, the treatment plan for tooth extraction and replacement it with an implant was proposed, but as a temporary treatment, the pulp chamber was filled with cold ceramic.

Prognosis of root canal treatment in teeth that fail during instrumentation has been reported poor.^[2] Although complete or partial obstruction of the canal path is observed in radiography, according to studies performed on the canal at histologic sections, the canal has been reported semi-permeable that may be a pathway for microbes to enter the periapical tissue.^[3] In this case, due to the treatment plan and the failure to find the canal, the tooth needed to be temporarily closed at the end of the dental treatment session because the possible opening of the path could lead to more microbial transmission and periapical lesion progression. It was essential to choose a proper material to achieve enough sealing, so cold ceramic was used [Figure 2].

Cold ceramic is an MTA-like bioceramic material with the proper sealing ability, which has been introduced as a root-end filling material. In the presence of moisture, the initial setting time of this material is 15 min, and it becomes fully set within 24 h.^[4] In this case, the proper sealing ability of the material as well as its immediate setting in the presence of moisture has made it suitable for being placed in the pulp chamber to separate the root canal from the oral environment.

Biocompatibility and noncarcinogenicity are essential factors for a material that is used in contact with the oral environment.^[3] A study was conducted on rats to compare tissue response to cold ceramics and MTA, which showed that the biocompatibility of cold ceramics was more than that of MTA in a long time.^[5] Furthermore, a histological study showed that the inflammatory response of soft tissue to cold ceramic is less than that of MTA in a long time.^[6]

It was found in a 12-year study that only 62.5% of calcified teeth with periapical lesions healed completely.^[19] In the presented case, after 6 years of which the patient returned, he did not express

any pain or discomfort during the time. In addition, although in radiograph, periapical lesion was not completely eliminated, relative healing and bone regeneration were amazingly seen [Figure 3]. Due to these items, this unusual treatment is considered to be relatively successful. This successful reaction can be due to the effect of cold ceramic on reducing tooth permeability or the reaction of the patient's immune system or other factors which further studies are needed to confirm or rule out these factors.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article.

REFERENCES

- Berman LH, Hargreaves KM. Cohen's Pathways of the Pulp Expert Consult-E-Book. China: Elsevier Health Sciences; 2015.
- Cvek M, Granath L, Lundberg M. Failures and healing in endodontically treated non-vital anterior teeth with posttraumatically reduced pulpal lumen. *Acta Odontol Scand* 1982;40:223-8.
- Torabinejad M, Walton RE, Fouad A. Endodontics-E-Book: Principles and Practice. China: Elsevier Health Sciences; 2014.
- Modaresi J, Hemati HR. The cold ceramic material. *Dent Res J (Isfahan)* 2018;15:85-8.
- Modaresi J, Yavari SAS, Dianat SO, Shahrabi S. A comparison of tissue reaction to MTA and an experimental root-end restorative material in rats. *Aust Endod J* 2005;31:69-72.
- Mozayeni MA, Salem Milani A, Alim Marvasti L, Mashadi Abbas F, Modaresi SJ. Cytotoxicity of cold ceramic compared with MTA and IRM. *Iran Endod J* 2009;4:106-11.
- Akhavan A, Rad ES, Mehdizadeh M, Mousavi SB, Modaresi J. Radiopacity evaluation of a new root-end filling material (NREFM) with two types of radiopacifiers in comparison to pro-root MTA and Portland cement. *J Isfahan Den Sch* 2012;8:221-8.
- Modaresi J. Perforation repair comparing experimental new material "cold ceramic" and amalgam. *Asian Dentist* 2004;11:6-7.
- Modaresi J, Aghili H. Sealing ability of a new experimental "cold ceramic" material compared to glass ionomer. *J Clin Dent* 2006;17:64-6.
- Modaresi J, Bahrololoomi Z, Astaraki P. *In vitro* comparison of the apical microleakage of laterally condensed gutta percha after using calcium hydroxide or cold ceramic as apical plug in open apex teeth. *J Dent* 2006;7:63-9.
- Mokhtari F, Modaresi J, Javadi G, Davoudi A, Badrian H. Comparing the marginal adaptation of cold ceramic and mineral trioxide aggregate by means of scanning electron microscope: An *in vitro* study. *J Int Oral Health* 2015;7:7-10.
- Jacobsen I, Kerekes K. Long-term prognosis of traumatized permanent anterior teeth showing calcifying processes in the pulp cavity. *Eur J Oral Sci* 1977;85:588-98.
- Holcomb JB, Gregory WB Jr. Calcific metamorphosis of the pulp: Its incidence and treatment. *Oral Surg Oral Med Oral Pathol* 1967;24:825-30.
- Amir FA, Gutmann JL, Witherspoon DE. Calcific metamorphosis: A challenge in endodontic diagnosis and treatment. *Quintessence Int* 2001;32:447-55.
- McCabe PS, Dummer PM. Pulp canal obliteration: An endodontic diagnosis and treatment challenge. *Int Endod J* 2012;45:177-97.
- Curry MC. The Utilization of Case Difficulty Assessment when Determining Endodontic Referral; 2010.
- Wu D, Shi W, Wu J, Wu Y, Liu W, Zhu Q. The clinical treatment of complicated root canal therapy with the aid of a dental operating microscope. *Int Dent J* 2011;61:261-6.
- Yang YM, Guo B, Guo LY, Yang Y, Hong X, Pan HY, *et al.* CBCT-aided microscopic and ultrasonic treatment for upper or middle thirds calcified root canals. *Biomed Res Int* 2016;2016:4793146.
- Akerblom A, Hasselgren G. The prognosis for endodontic treatment of obliterated root canals. *J Endod* 1988;14:565-7.