MJoSHT
Malaysian Journal of Science, Health & Technology
[mjosht.usim.edu.my]

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Case Report

Delayed Repair of Large Iatrogenic Furcation Perforation using MTA

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Article Info
Article history:
Received:22 April 2022
Accepted:4 August 2022
Published:1 September 2022
Academic Editor:
Ahmad Izzat Ahmad Tajjudin
Malaysian Journal of Science, Health & Technology
MJoSHT2022, Volume 8, Special Issue
eISSN: 2601-0003
https://doi.org/10.33102/2022264

***Abstract* — The purpose of treating furcal perforation is to seal the artificial communication between the canal space and the periradicular tissue to prevent the periodontal breakdown. The duration, size and location of the perforation were identified as the primary prognostic factors for determining successful treatment. Mineral trioxide aggregate (MTA) has been regarded as an ideal material for perforation repair owing to its excellent sealability and biocompatibility. The present case report illustrates the efficiency of MTA in the delayed treatment of a large iatrogenic furcation perforation of the right mandibular second molar tooth with a duration of 8 weeks from perforation occurrence to repair. The tooth received a two-visit non-surgical root canal treatment prior to perforation repair using MTA without internal matrix. The healing of periradicular radiolucent lesions and interradicular radiolucency at 18 months indicated the successful sealing of the perforation. The outcome also indicated that MTA was able to seal the furcation perforation effectively in a large defect with delayed treatment time.**

***Keywords* — furcation perforation; mineral trioxide aggregate; root perforation**

I. INTRODUCTION

Root perforation is a pathological communication between root canal system and external tooth surface [1]. Furcation perforation in multirooted teeth is an accidental procedure that commonly occur during the search for canal orifices. It predisposes the periradicular tissue to chronic inflammation and causes tooth demise if untreated [2].

The prognosis depends on the location, size and duration of the perforation. Perforations in the coronal third including furcation perforations, are more serious than middle-third and apically situated perforations. The duration from the occurrence of the defect is another critical factor; a delay in perforation repair poorly affects the post-treatment prognosis [3].

The ideal material for perforation treatment should promote periradicular tissue regeneration; have antimicrobial activity and good sealing ability, radiopaque, resistant to moisture, non-toxic, non-irritant, non-carcinogenic and biocompatible [4]. Mineral trioxide aggregate (MTA) has been recognised as a gold standard material owing to its good short-term clinical outcome in treating small and fresh furcation perforations and its effective sealing ability with evidence of clinical healing in the surrounding periodontal tissue [5].

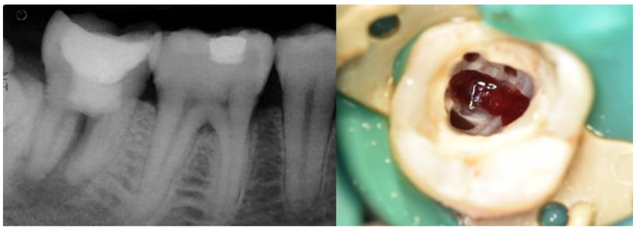
This case report's objective was to provide 18-month follow-up findings on the delayed repair of a large furcal perforation using MTA without internal matrices.

II. CASE REPORT

This 32-year-old patient was initially treated by an undergraduate student for non-surgical root canal treatment (NSRCT) on tooth 47. Unfortunately, an iatrogenic perforation occurred at the furcation area, and the case was referred to an endodontic specialist clinic for further management.

The tooth was tender upon percussion with no presence of swelling, abscess or mobility. Periapical radiograph revealed the presence of intraradicular radiolucency and periapical radiolucency involving mesial and distal roots. Whole occlusal cavities appeared to be radiopaque, indicating the existence of restoration (Fig. 1a).

An attempt to repair the perforation site using MTA on the first visit failed because of the inadequate thickness of the MTA applied as the site of perforation was at the same level with the canal orifices. Hence, the treatment decision changed to commence NSRCT first, and furcation perforation was repaired using MTA-Angelus. The duration from the occurrence of perforation to repair was 8 weeks. A verbal consent obtained from the patient for this case to be published.



(a) (b)

Fig 1. (a) Preoperative radiograph of tooth 47 showing the extension of occlusal restoration extended to pulpal floor with interradicular radiolucency and periapical lesion. (b) Clinical picture showing the large furcation perforation involving the whole pulpal floor extending to the lingual wall.

III. CLINICAL PROCEDURE

The treatment was performed under dental dam isolation with the aid of a dental operating microscope. Upon the removal of the restoration, the presence of a large furcation perforation involving the whole pulpal floor extending to the lingual wall with approximately 4×7 mm2 in size with active bleeding (Fig. 1b).

Three canals were located: mesiobuccal, mesiolingual and distal canals. The cavity was disinfected thoroughly using 2.5% sodium hypochlorite, and gentle compression was applied using cotton pellet wetted with adrenaline to control the bleeding. The perforation site was located at the same level of the orifices; thus, a cotton pellet and Cavit G (3M ESPE, Germany) were placed over the canal orifices prior to perforation repair to prevent the invasion of the repair material into the canals. MTA was then placed directly into the perforation area and gently packed with a moist cotton pellet to achieve a condensed filling. The MTA was packed up to the same level of the orifice and was verified radiographically, which showed a thin layer of the repair material (Fig. 2a).

Unfortunately, at 1 week follow-up, the MTA did not set and was flushed out during irrigation. Hence, the treatment plan was changed to perform NSRCT followed by perforation repair. The working length was determined with the use of electronic apex locator. (Root ZX II, J Morita Inc). The canals were debrided using a ProTaper Next® rotary system (Denstply Maillefer, Ballaigues, Switzerland). Non-setting calcium hydroxide (Calasept® Plus) was placed as the intracanal medicament. The obturation was performed using warm vertical compaction obturation technique with AH Plus sealer (Denstply Maillefer, Ballaigues, Switzerland).

The bleeding was controlled with gentle compression using cotton pellet wetted with adrenaline. Five mm-thick MTA was placed over the perforation site without an internal matrix, and the placement was verified radiographically (Figs. 2b and 2c). A layer of 2 mm glass ionomer cement was placed on top of the MTA, and composite core build up was performed on the same visit. Later, a porcelain-fused metal crown was constructed.

The patient was followed up at 6 and 18 months and reported no symptoms. Clinical examination revealed tooth was asymptomatic with no sign of periodontal breakdown. Radiographic examination revealed a reduction in the size of the periapical radiolucency (Fig. 3a), and the interradicular radiolucency appeared to be resolved after 18 months (Fig. 3b).

(a) (b) (c)

Fig. 2. (a) Radiograph after the first attempt of repair showing thin placement of MTA over the perforation site. (b) Postoperative radiograph after the completion of NSRCT with 5mm placement of MTA over the perforation site. (c) Clinical pictures after the MTA placement that covers the whole obturated canals and perforation site.

III. DISCUSSION

Furcation perforations usually occur because of inattentive access preparation. In this case, the operator overestimated the depth of the pulpal floor.

The failure in repairing this large defect during the first attempt may be related to poor bleeding control and inadequate repair material placement. This failure also reflects the tendency of MTA to be washed out upon contact with excessive blood or other fluids. Bleeding at the perforation site should be controlled adequately before MTA placement, as blood contamination considerably reduces MTA microhardness and leads to low resistance to displacement [6, 7]. The inadequacy of repair materials can also be a contributing factor to the poor outcome of repair procedures [8]. However, no specific recommended thickness for furcation perforation repair was discussed in the literature [9]. The present case is evidence that the placement of a thin layer of MTA for furcation perforation repair tends to fail.

The prognosis for this case was considered unfavourable as the size was large and the repair time was delayed, as it was performed after the failure of the first attempt of repair and after the completion of the two-visit NSRCT, which took 8 weeks since the perforation occurred. Surprisingly, signs of healing were found after 6 and 18 months. This finding may reflect the efficacy of the strict treatment protocol applied, in which was performed under dental dam isolation with copious cleaning using 2.5% sodium hypochlorite. Holland et al. [10] postulated that debris might prevent the MTA and periodontal tissue from coming into direct contact with one another, subsequently interfere with the healing process. Hence, the use of sodium hypochlorite with a concentration of 1%–5% contributes a major role in disinfecting the perforation site and enhancing the opportunity to heal [8, 11].

The size of the perforation is crucial in determining the outcome of the repair procedure, and the use of an internal matrix to prevent the extrusion of the sealing material was recommended to prevent further periradicular tissue inflammation [12]. Please give example of internal matrix. The tissue response seems to be influenced by the nature of the sealing material; therefore, it should be kept within the limits of the defect. In this case, the furcal perforation was large, but no internal matrix was placed. In an animal study [13], when MTA was accidentally extruded into the periradicular tissue, hard tissue deposition and cementum were observed over the materials along with a regeneration of periodontal apparatus. This finding was supported by another study, which concluded that MTA does not need a barrier when used to repair large furcal perforations as better results were found when furcal perforations were repaired by MTA without internal matrix as opposed to MTA with internal matrix [11].

The success for this case is also attributed to the properties of MTA. MTA is a biocompatible material that allows bone regeneration. Ford et al. [14] revealed the excellent biocompatibility of MTA and proved histologically that the furcation perforations sealed with MTA demonstrated a repaired periodontium and the formation of a new cementum over the material. The outcome of the present case is comparable to the results of other several case reports that indicate favourable healing results when MTA was utilized to seal perforation at the furcation location. [5, 8, 15].

IV. CONCLUSIONS

The use of MTA in aseptic control with adequate thickness (4–5 mm) to seal a large furcal root perforation with delayed repair time is associated with good short-term clinical outcome.

CONSENT TO PARTICIPATE

Written informed consent was obtained from the patient for the anonymized information to be published in this article.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest.

ACKNOWLEDGEMENT

The author would like to thank the patient for consenting to this case report being written and Universiti Kebangsaan Malaysia (UKM) for the support and facilities provided.

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