Severe Unintentional Extrusion of Mineral Trioxide Aggregate during Apexification

Abstract
The aim of this report was to present the long-term clinical and radiographic outcomes of a case including severe unintentional extrusion of mineral trioxide aggregate (MTA). An 11-year-old boy was referred with a previously traumatized permanent central incisor which was temporarily treated by using calcium hydroxide root canal filling material. Since having an open apex and a large periapical lesion, root canal treatment with MTA apexification was planned. During the apexification process, a huge amount of MTA was unintentionally extruded into periapical tissues. The parents were informed about the complication, and the obturation of the remaining root canal was completed. Clinical and radiographic follow-up was performed for 4 years. Complete healing of periapical lesion was confirmed by the radiographic follow-up at the 48th month. Patients should be followed-up for giving a chance to observe periapical healing without any surgical removal if the MTA is unintentionally extruded.

Keywords: Extrusion, mineral trioxide aggregate, periapical healing

Introduction
Trauma is one of the most common reasons which cause the inflammation or necrosis of the pulp tissue in permanent teeth.[1] In this situation, root canal treatment of the traumatized tooth is required. However, the endodontic treatment is complicated if the apex of a permanent tooth is resorbed and opened by a periapical lesion.[2,3] Therefore, creating an apical plug to eliminate the difficulties of root filling process is essential in teeth with open apices.[1‑3]

The technique of one-visit apexification using mineral trioxide aggregate (MTA) was presented as an effective treatment method,[4,5] and the advantageous properties of the material such as excellent biocompatibility,[4,6] antimicrobial properties,[5] stimulation of hard tissue formation,[7] and effective sealing ability[4,7] were emphasized. MTA requires an orthograde condensation process during the apexification procedure, and the filling material can be unintentionally extruded into periapical tissues because of open apices.[2,3] The aim of this case report was to present the long-term clinical and radiographic outcomes of severe unintentional extrusion of MTA.

Case Report
A systemically healthy, 11-year-old boy was referred to Bulent Ecevit University, Faculty of Dentistry, Department of Pediatric Dentistry with a previously traumatized permanent maxillary left central incisor. According to the parents, trauma occurred 4 months ago but the patient was taken to a special clinic at the end of the 4th month because of experiencing toothache and swelling in the adjacent gingiva. In that clinic, the tooth was temporarily treated by using calcium hydroxide (CH) root canal filling material, and the patient was directed to us.

Clinical examination indicated a crown fracture of the central incisor and a sinus tract that was located on the adjacent gingiva. The radiographic examination [Figure 1a] revealed a wide radiolucent area in periapical tissues. In addition, some amount of CH was extruded into the periapical tissues because of an open root apex.

The tooth was followed-up for 2 weeks, and removal of CH was decided when the sinus tract had disappeared. Following anesthesia and placement of rubber dam, CH was removed by using an #80 H-file and copious sterile saline solution. The root canal finally

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irrigated with 5 ml of 2.5% sodium hypochlorite and 10 ml of sterile saline solution, respectively. Then, the root canal was dried with sterile paper points, and the working length was calculated as 1 mm short of the radiographic apex.

MTA (Angelus, Londrina, PR, Brazil) was prepared according to the instructions of the manufacturer, and the material was delivered to root apex. During the process, the abnormal situation was noticed that the apical plug was sensed too late even a huge portion of the MTA was delivered according to calculated working length. Furthermore, delivered MTA was suddenly sensed at the middle third of the root canal. An immediately taken periapical radiograph revealed that a huge amount of the MTA was unintentionally extruded into the periapical tissues [Figure 1b]. A wet cotton pellet was placed on the MTA, and the cavity was closed temporarily with glass ionomer cement. The parents were informed about the extruded MTA and its possible consequences. Twenty-four hour later, the rest of the root canal was filled with a fiber post plus dual cure resin cement to provide coronal restoration with adhesive composite resin. After the completion of the coronal restoration, long-term clinical and radiographic follow-up was done. In the 6th month follow-up session, the size of the periapical lesion started to diminish [Figure 1c], and the appreciable decrease in the lesion size observed in the 12th and 24th month [Figure 1d and e]. Complete healing of periapical lesion was confirmed by the radiographic follow-up at the 48th month [Figure 1f]. During these sessions, no clinical symptoms were observed.

Discussion

Various complications such as severe inflammation, necrosis of the bone tissue, or foreign body reaction may occur if the root filling material is extruded. Therefore, it was suggested to be cautious during the filling process in a root canal treatment procedure, especially in teeth with open apices. Although the filling process was gently performed in the present case, the filling material extruded, and having wider opening at the root apex may be considered as the main reason of this complication.

After the treatment is completed, long-term (4 or 5 years) clinical and radiographic follow-up was suggested to have the exact clinical outcomes for the teeth with periapical lesions. On the other hand, Azim et al. reported that the average time required for a periapical lesion to heal was 11.78 months which was similar to previous findings addressing that 1 year is the minimal time that is necessary to reach the outcomes of a treatment. In the present case, the follow-up period was 4 years, and this period can be considered as sufficient time to determine the treatment outcomes of severely extruded MTA. According to the 4-year follow-up results, it can be concluded that the extrusion of MTA did not prevent the periapical healing. Although the surgical removal of the extruded material may be addressed as a required procedure, the present case completely healed without any further intervention, and this result may be identified with the advantageous properties of MTA such as having an excellent biocompatibility, providing the regeneration of periapical tissues to a normal condition, and the bone deposition without an inflammatory response. In addition, MTA prevents the continued irritation of periapical tissues with its good sealing ability, and it provides a proper environment for healing of periapical tissues. For these reasons, not causing any host response, stimulation of bone deposition, and good sealing ability may be accepted as three important factors to obtain favorable periapical healing results with MTA even the material was unintentionally extruded.

Conclusion

The clinicians should be cautious during the placement of MTA as an apical plug even the extruded material did not prevent the healing of the periapical lesion in this case. If the MTA material is extruded, the patients should be informed about the complications and the possible consequences. In addition, long-term clinical and radiographic follow-up should be organized for giving a chance to observe periapical healing without any surgical removal of the extruded material because of the advantageous properties of MTA.

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Conflicts of interest
There are no conflicts of interest.

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