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Continuation of Apexogenesis around Fracture Endodontic File

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Abstract: ***Objectives: During endodontic treatment, instruments can be broken in the canal for various reasons. While it is generally seen that the instruments should not be left broken beyond the apex, this case report shows that a tooth with an open apex may form calcified tissue around the broken file outside the apex. Case report: The 9-year-old male patient who had an endodontic file fracture in the mesiobuccal canal of the right lower first molar tooth was found to be 1.5 mm outside the root. It was decided to fill the canals by leaving the file in this state. At the end of the 6-month follow-up, hard tissue formation was observed around the file, but no pathology was observed. Conclusion: Although it is shown in this case report that the instruments are broken in the canal when the sterile working environment overflows from the root end, the apex does not prevent closure, but many studies are needed on this subject.***

Keywords: Apexogenesis, Broken Instrument, Endodontic Treatment, Immature Root

1. Introduction

Root canal treatment of young permanent teeth with open apex, which has not completed root development, is an important clinical problem in children and adolescents. Caries seen due to insufficient oral hygiene can cause root development to stop due to infection and loss of vitality in pulp chambers that are not matured after plating and the pulp chambers are large. There are two treatment options for immature teeth depending on the degree of pulpal involvement, apexogenesis and apexification (1).

Nowadays, the accepted approach as an alternative to apexification treatment is to create a physical apical barrier by using different biomaterials (2).

In this technique, short-term root canal disinfection with calcium hydroxide is followed by placing a material in the apical portion of the root to act as a physical barrier. Following the hardening of the material, endodontic treatment is completed by placing a root canal filling material in the rest of the canal. Devital immature teeth present many difficulties for adequate endodontic treatment. The apical portion of the root canals is wider than the coronal and the thin dentin walls make these teeth susceptible to fractures(3,4). However, due to various factors such as the clinician's experience in the formation of the root canal, the technique used, the presence of the root canal curvature, the rotation speed, torque, design and manufacturing of the instrument and the sudden movement of children who are not fully cooperated can cause broken canal instruments(5-10). However, in pediatric patients with molar incisor hypomineralization, where patient cooperation is difficult, as the severity of molar incisor hypomineralization increases (11), dental anxiety and fear may result in difficulty in cooperating, so discontinuation of the broken instrument may be considered. Even experienced physicians experience this negative situation, leaving clinicians difficult during treatment and patients in difficult situations because of the long duration of treatment and the need for extra dental appointments (12). If the file is broken in the root canal, the clinician should determine the treatment options according to the vitality of the tooth, the anatomy of the root canal, the condition of the periapical tissues, the position and type of the broken instrument (13).

This case report demonstrates that in an open-apex tooth, the root formation may continue to develop around the broken file during treatment, which may result in hard tissue formation around the broken file.

2. Case Report

A 9-year-old patient presented to our clinic with a complaint of pain in her right permanent lower first molar tooth. The patient was diagnosed with developed acute pulpitis due to post-eruptive destruction due to molar incisor hypomineralization. It was decided that the apexification of the tooth was not closed yet.(fig 1)

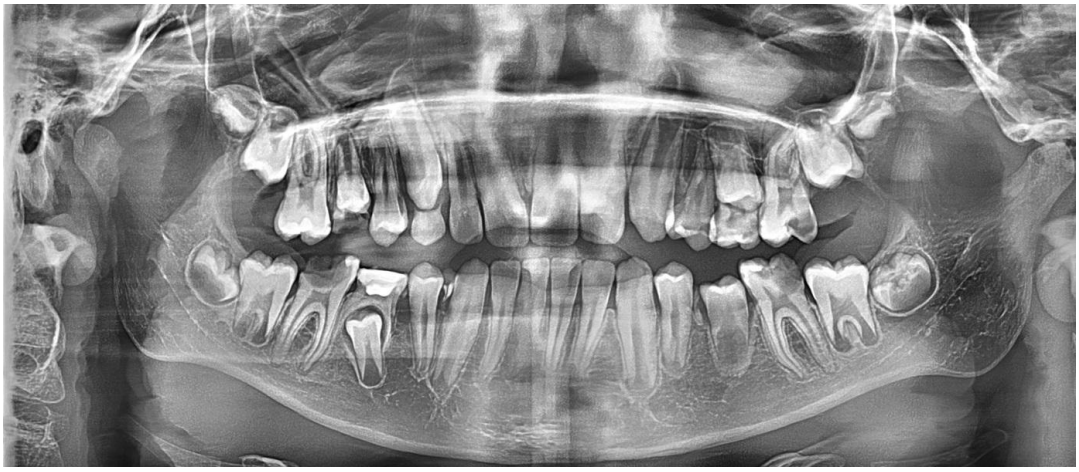

Figure1: Patient's first radiograph

After inferior alveolar nerve block, caries were cleaned and pulp chamber was opened. Apex locator (VDW Raypex 6, Munich, Germany) and 10 no.K file (VDW, Munich, Germany) were used to calculate the length of the duct and radiographically confirmed the length of the duct.(fig 2)

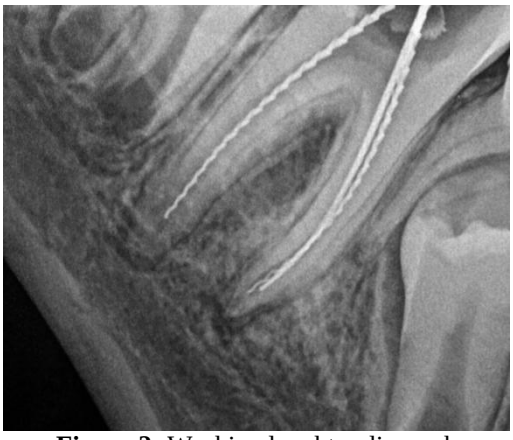

Figure 2: Working lenght radiograph

After the channel was washed with 1.5% sodium hypochlorite (Wizard, Izmir, Turkey) and 17% EDTA (Wizard, Izmir, Turkey), the root canal was expanded using the Protaper file system (Dentsply Sirona, Charlotte, USA). Irrigation was repeated after each file using SX, S1 files, respectively, in the mesiobuccal (MB) canal. The file S2 was broken 3.5 mm from point D0 because the child closed his mouth during use. Radiographs showed that the file overflowed 1.5 mm from the apical of the MB canal.(fig 3)

Figure 3: Broken file in mesiobuccal canal

After shape of the mesiolingual and distal canals, MB canal was irrigated with 17% EDTA and then filled with lateral condensation method 2 mm shorter from the apical using AH Plus (Dentsply Sirona, Charlotte, USA) and gutta-percha (Dentsply Sirona, Charlotte, USA).

The distal and mesiolingual canals were filled using gutta percha and AH Plus. Excess gutta percha was removed and the restoration was completed with glass ionomer cement (KetacCEM, 3M ESPE, Neuss, Germany) and composite resin (Filtek Z250, 3M ESPE, Neuss, Germany).(fig 4)

Figure 4: Restoration completed

When the patient came to the clinic 6 months later, no symptom was found in the tooth, while the radiography showed that the root development continued and the apex was closed and dentine and cementum tissue developed around the file that had previously appeared 1.5 mm above the apex.(fig 5)

Figure 5: 6 months later control radiograph

3. Discussion

Anatomically, curved ducts generally bend over multiple planes, and especially in the apical triple region of the duct, excess dentin should be removed for direct access to the fracture instrument. It is therefore not recommended to routinely remove instruments beyond the site of the inclination(14). The success rate of the treatment was 56.6% in cases where the broken device was not removed during the 10-year follow-up of canal treatments (15).

It has been reported that the removal of the fractured part, including infected pulp teeth, does not adversely affect treatment success (16). In addition, considering the amount of dentin to be removed will weaken the tooth, the clinician should evaluate the advantages and disadvantages and shape the treatment accordingly (14). By-pass or removal of the broken file is necessary for effective flushing, shaping and filling of the duct. Long-term prognosis depends on the condition of the tooth before treatment (17). At the same time, the stage of the canal preparation at the moment the instrument is broken, the anatomy of the canal, the position and type of the fracture affect the prognosis (18).

Infected necrotic pulp tissue can cause severe inflammatory reaction in periapical tissues, and it has been reported by many researchers that removal of this tissue and controlling the infection will result in apical closure (19-22). Therefore, after complete removal of the necrotic tissue, it was decided to leave the broken canal file in place during expansion in the root canal. As the viability of the stem cells and odontoblasts in the apical region responsible for dentin production continued, dentin formation continued in this area and apical construction was completed.

Radiography (fig. 3) shows that the lamina dura is enlarged by 2 mm in the apical, and although there is no hard tissue barrier in the apical, the cells found here remain viable and dentin production continues.

We think that the EDTA gel used during the treatment induces dentin production by providing the release of dentin matrix protein from the dentin tissue odontoblasts (23).

4. Conclusion

Removal of the broken instrument in the root canal is a very difficult and time consuming procedure. In vital root canal treatments, when the tooth is open apex, it is shown that the broken files can be left in place by exceeding the apex, in this case the dentin formation can continue and the apex can be closed and further studies are needed.

5. Conflict of Interest

There is no conflict of interest.

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