Retrieval of Unintentional Separated File in a Maxillary Premolar with Curved Canals Using Ultrasonic Technique: A Case Report

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Abstract

Root canal morphology sometimes includes complex structures that are not easily visible on radiographs, which can make endodontic therapy challenging for practitioners. Cleaning, shaping, and obturation are essential components for successful endodontic treatment. Continually applying tension and compression can cause the initiation of cracks in endodontic files, often leading to file breakage. The objective of this case report is to report the management of the separated file in curved canal premolar tooth using the ultrasonic technique. Many variables, including the instrument's position in relation to the canal curvature, its depth in the canal, the type of broken file, and the size of the fragment, affect the successful removal of broken files. It is essential to remove these fragments carefully to avoid causing more damage to the dentin around the root. A thorough understanding of dental root anatomy is essential to effectively remove the broken file and provide a favorable treatment result.

Keywords
- curved canal
- premolar
- separated file
- ultrasonic technique

Introduction

Root canals often have a complex morphology that may not be easily seen on radiographs, which can make endodontic therapy challenging for dental practitioners. Cleaning, shaping, and obturation are essential components of endodontic therapy. The combination of narrow and curved canals, the quality of the instrument, and operator fatigue may cause endodontic instruments to separate inside the root canal. Also, repeated traction and compression during usage can compromise the integrity of endodontic files, often leading to file breakage.[1–3] This can subsequently lead to failure of endodontic treatment.

Dealing with such cases involving instrument separation can pose a serious challenge to the clinician. Using ultrasonic techniques alongside the dental operating microscope has proven to be dependably successful and safe in efficiently removing fractured files from root canals.[4,5] The fracture rates of stainless steel hand files range from 2 to 6%, while the fracture rates of NiTi rotary files range from 1.04 to 13.54%.[6]

The most efficient method for dealing with a separated endodontic file is to remove it. Several techniques and tools have been developed for retrieval of separated endodontic files.[4] Using a dental microscope along with an ultrasonic instrument has been repeatedly recognized as a successful and safe procedure in numerous studies.[4]

Case Report

A 22-year-old female patient reported to our institute with the complaint of pain in her left maxillary premolar tooth

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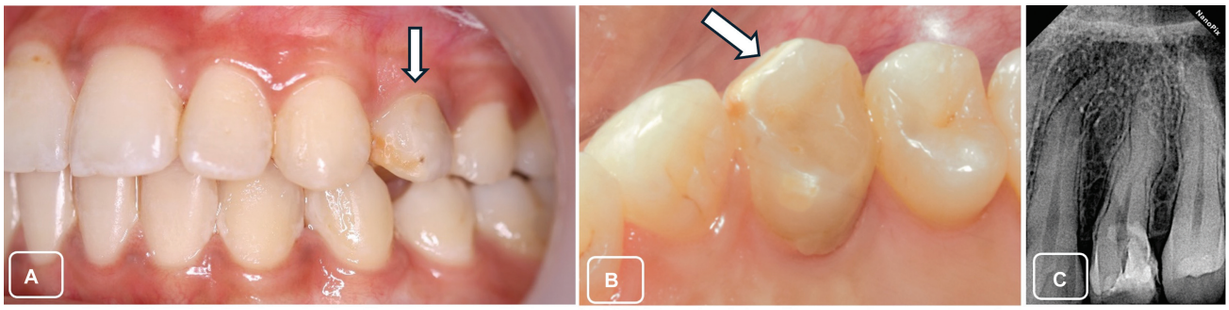

Fig. 1 (**A**) Labial appearance of the maxillary first premolar. (**B**) Occlusal appearance of the maxillary first premolar. (**C**) Preoperative intraoral periapical radiograph of the maxillary first premolar.

(►**Fig. 1a**). She reported soreness in the same tooth that had been restored earlier (►**Fig. 1b**). On clinical examination, secondary caries of tooth 24 was observed. The tooth's radiographic examination revealed a restored tooth with curved root canal anatomy and secondary caries (►**Fig. 1c**). There was mild tenderness on percussion; however, the gingiva appeared normal. The diagnosis of symptomatic irreversible pulpitis with normal periapical findings was made in this case.

The initial appointment involved local infiltration of tooth 24 with lignocaine and isolation with a rubber dam. The old restoration was removed, and the secondary caries was excavated. The access opening was done using the standard protocol of a no. 4 round bur, followed by use of an endo-access bur (Coltene, Germany).

The canal negotiation was performed (►**Fig. 2a**) utilizing no. 8 and no. 10 K-files (Mani, Japan). The working length was measured using an apex locator (Root ZX II, J Morita, Japan), which revealed the working length of the buccal canal and palatal canals to be 18.5 and 18 mm, respectively. Subsequently, the glide path was established using the ProGlider rotary glide path file, 16/02 (Dentsply, United States). However, once the rotary glide path file came out of the buccal canal, it was observed that a part of the instrument had separated in the buccal canal itself. This was confirmed when a radiograph was taken, which clearly showed the separated file in the buccal canal (►**Fig. 2b**).

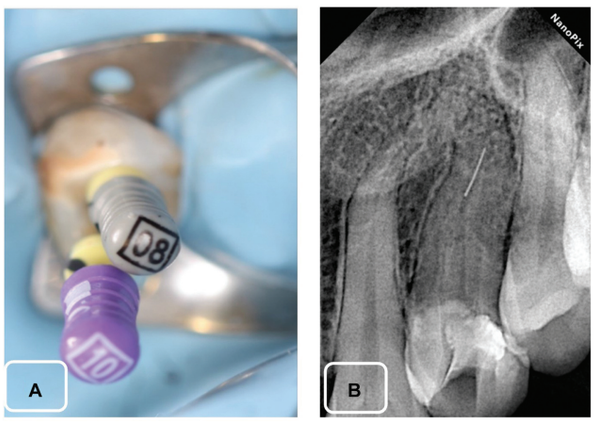

Fig. 2 (**A**) Negotiation of root canals with K files. (**B**) Radiographic confirmation of separated endodontic instrument.

A dental operating microscope (Zeiss, Germany) was utilized to examine the fractured file, followed by the creation of a staging platform utilizing modified Gates Glidden instruments (Mani, Japan). The ultrasonic method utilizing endo ultrasonic tips (Proultra, Dentsply, United States) was applied to the fractured file until it became loose and was successfully removed (►**Fig. 3a, b**).

The cleaning and shaping process was then carried out using ProTaper Next (Dentsply, United States) with master apical file as X2 (25/06). As irrigant, 5.2% sodium hypochlorite was used throughout the procedure and the final irrigant utilized was 17% EDTA (ethylenediaminetetraacetic acid), which was ultrasonically activated for 1 minute. Chlorophenol camphor menthol intracanal medicament was inserted in the root canals, and the patient was scheduled for a follow-up appointment in a week. The dressing was removed by irrigation and the canals were dried using paper points. A master cone fit trial was taken to confirm the working length (►**Fig. 3c**), and thereafter, obturation was done utilizing a single-cone technique with the thermoplasticized injection process (►**Fig. 3d**). The post-endodontic restoration was done using a posterior composite resin (Filtek P60, 3M, Germany).

Discussion

Many professional organizations and specialists suggest that the degree of root canal curvature is a factor that increases the likelihood of errors during the preparation procedure. This increased likelihood of mistakes can result in difficulties in the next phases of root canal therapy.[7]

When an endodontic instrument breaks during a root canal treatment, it hinders the process of cleaning and shaping the root canal system. The inability to continue with additional cleaning and shaping procedures could compromise the overall effectiveness of the treatment. Usually, the prognosis for these teeth is less favorable than teeth having conventional endodontic therapy. Using an ultrasonic equipment with a microscope is a cautious method for dealing with a broken file, especially when compared to other choices. This method allows for a gradual removal of dentin structure with reduced potential damage to the root's integrity and the surrounding periodontal tissue.[8,9]

Fig. 3 (**A**) Radiographic confirmation of successful removal of separated instrument. (**B**) Separated rotary file removed from the root canal. (**C**) Master cone fit evaluation. (**D**) Obturated maxillary first premolar.

Several parameters, including the instrument's position in relation to the canal curvature, its depth within the canal, the exact type of broken file, and the size of the fragment, affect the successful removal of broken files. Retrieval is reasonably uncomplicated when the instrument is positioned in the straight part of the canal and one-third of its complete length is visible. It is essential to remove these fragments carefully to avoid causing more damage to the dentin around the root. To properly handle a fractured file, it is recommended to use ultrasonic tips and a dental operating microscope after setting up a staging platform. This method guarantees a positive result for fragment removal while reducing the risk of harm to the dentin structure.[10]

This case report details the effective endodontic treatment of a broken file removal in a curved maxillary first premolar. Success was largely credited to the utilization of magnification, which facilitated the identification of broken instruments, ultrasonic irrigation, and changed obturation techniques.

Conclusion

Removal of a separated file from the root canal is a big challenge for the operator. The use of magnification accompanied by illumination and utilization of specific ultrasonic instruments have a pivotal role in instrument retrieval. A thorough understanding of the root canal anatomy is crucial to effectively remove the separated file and ensure a favorable treatment result.

Conflict of Interest

None declared.

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