

Management of Separated Endodontic Instrument and a Blocked Canal - A Case Report

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ABSTRACT

The fracture of endodontic instruments and canal blockage is a procedural problem creating a major obstacle to normal routine endodontic therapy. The separated instrument, particularly a broken file, leads to metallic obstruction in the root canal while canal blockage, caused by packing dentin chips and/or tissue debris, impedes efficient cleaning and shaping. Negotiating the canal and achieving patency is a must but when attempts fail to bypass such a fragment or gaining patency becomes difficult, it should be achieved by newer techniques and equipments. Dental operating microscope and ultrasonics have found indispensable applications in a number of dental procedures. This clinical case demonstrates the usage of an ultrasonic device under operative microscope in the removal of separated NiTi instrument and achieving patency in symptomatic premolars.

Keywords: Ultrasonic; separated instrument; canal blockage; premolar.

INTRODUCTION

Endodontic mishaps that occur during cleaning and shaping are among the most frequent mistakes made during root canal therapy imperiling its success. They can arise for a variety of reasons, including lack of understanding, a dentist's negligence of details, while some totally unpredictable.¹ They range from ledge formation, canal blockage and instrument separation to perforation. Their management may require prolonged chair time and effort from the dentist and sometimes can be impossible. This article reports the management of an intracanal separated NiTi instrument and a blocked canal in symptomatic premolars.

CASE REPORT

A 21-years-old female was referred to the department of Conservative Dentistry and Endodontics, College

of Dental Surgery, BPKIHS, with pain in her upper left back region of the jaw for the management of previously initiated 24 and 25 with symptomatic apical periodontitis. She was undergoing endodontic treatment on 24 and 25 when the NiTi rotary instrument (*HyFlex*TMCM of #20, 0.4% taper) was separated in the buccal canal of 24, and 25 had an instrumentation-related blockage. Attempt to bypass file and retrieval of the fragment with hollow-tube based extractor was tried for 24 and gaining patency for 25 was attempted but was unsuccessful. The medical history of the patient was non-contributory. Diagnostic radiography revealed that the separated instrument extended along the root canal from the middle third to the apical third (Figure 1).

The tooth was symptomatic so the patient was notified about the treatment plan and she opted for retrieval of

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Citation

Rai A, Ayer A, Vikram M. Management of Separated Endodontic Instrument and a blocked canal - A Case Report. *J Nepal Assoc Pediatr Dent.* 2022;3(1):40-3.

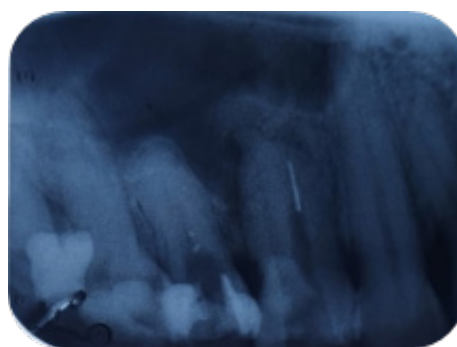


Figure 1. Preoperative radiograph showing separated instrument in 24.

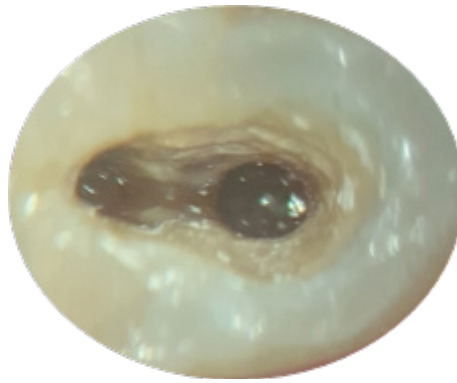


Figure 2. Separated file under microscope.

the instrument to salvage the tooth. The access cavity was reevaluated, but there was no need to modify it. An ultrasonic device (Ultra X, Eighteeth) with golden tip (25, 2%), was used to flare the canal under a dental operating microscope (Prisma, Labomed).

After flaring, the tip of the separated endodontic file (SEF) was visible under magnification and peripheral dentin was removed around the file tip in a counter-clockwise motion (Figure 2).

The canal was irrigated at a regular interval with normal saline to prevent any untoward damage to the periodontium from heat due to ultrasonic activation. Following irrigation, canals were dried with cotton pellet and paper points to re-visualize the separated instrument under the microscope. When about 1-2 mm of file tip was freed from the dentin, the free end of the instrument was activated with the ultrasonic (US) tip in a counter-clock direction to unscrew it from the tooth. After several attempts along with the protocol of intermittent irrigation and drying, the instrument was still lodged and fixed within the tooth. The pecking motion with the bluetip (#25, 2%) was made in the inner curvature of the instrument that loosened, the

fragment within the canal and SEF was flushed out with normal saline (Figure 3). The retrieved SEF was 4mm in length.

Intraoral periapical radiograph (IOPAR) confirmed the removal of SEF and calcium hydroxide as intracanal medicament was placed in the root canal followed by restoration with temporary filling material and scheduled for subsequent treatment at a later appointment (Figure 4).

Similarly, access chamber of 25 was re-entered after removal of temporary restoration using highspeed air-rotar and round diamond point with no modification needed to refine the access cavity. Coronal flaring was done with golden tip (#25, 2%) of the ultrasonic device under microscope. Blocked canal was negotiated with the help of pre-curved #8 and #10 C+ file (Densply, Maillefer) by smearing it with chelating cream (Meta Biomed MD-ChelCream) before introducing in the canals flooded with 1% NaOCl. The mark on the stopper of the #8 file was aligned with the direction of the curving root, and a delicate one- to two-mm vertical stroke was used to explore that path. When the file began to feel "sticky" and bonded to the canal walls, a small amount of watch-winding motion



Figure 3. Separated endodontic file measuring 4mm.

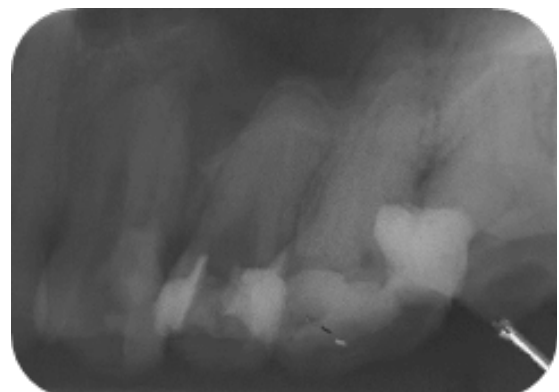


Figure 4. Radiograph after removal of SEF.



Figure 5. Working length radiograph till apex after opening the blocked canal.



Figure 6. Post Obturation radiograph.

was used while concurrently moving the file apically before its retrieval. Then, a #10 file was inserted into the canal in a watch-watching motion until the file got bonded to the dentin. Little watch-winding motion was done and the file retrieved followed by irrigation of canal with 1% NaOCl. Recapitulation of the canal was done with #8 file followed by irrigation and the cycle was repeated until apical terminus was reached. Once the patient felt some sensation in the periapex, apex locator was used to determine the working length and IOPAR was taken to confirm it (Figure 5).

The canal was irrigated and tooth was restored with temporary restoration after placing cotton pellet and further treatment scheduled at a later appointment. In the subsequent appointment, cleaning and shaping were performed manually on both 24 and 25, and obturation was performed with gutta-percha using cold lateral compaction technique and access cavity was restored with resin composite (Figure 6).

DISCUSSION

With the change in trends regarding biomechanical preparation of a root canal system, marked increase in the use of nickel-titanium (NiTi) rotary instruments is noticed. In the present case, the separated instrument was a NiTi file of size 20 with 4% taper and studies have revealed NiTi instruments to be more susceptible to separation than stainless steel hand instruments and is associated with fracture without warning.² Further, smaller files such as 4% taper of # 20 are recommended as a single use instrument compared to larger instrument due to the possibility of distortion during use as a result of torsional failure.³ Moreover, study among practitioner in USA has

revealed that majority of respondent practiced repeated use of NiTi files before disposal.⁴

Prevalence of instrument separation for rotary NiTi instruments is reported low at 1.33% but when not managed, have been documented to decrease the success of nonsurgical root canal treatment as well as cause anxiety to the patient.^{5,6} Management of such mishaps consist of first, recognition of error then locate the site of mishap followed by corrective measures. Studies have shown that the successful retrieval depends on: the level of separation (coronal, middle or apical third); location in relation to the root canal curvature; the type of separated instrument; its length; the degree of canal curvature and the tooth type.⁷

Treatment of cases with intracanal separated instrument can range from conservative, where the choices includes either bypass of the fragment, removal of the fragment or retaining it with instrumentation and obturation coronally to the fragment, to surgical. In this case, the tooth was symptomatic and attempts to bypass the instrument failed so retrieval of the fragment was tried and it was successful. For the removal of a separated instrument, variety of techniques and systems have been developed. Instrument retrieval using retrieval system such as masserann kit or IRS etc can cause destruction of canal dentin whereas ultrasonics, in combination with the operative microscope constitute the most effective and reliable tools for removing a separated endodontic instrument from a root canal.^{7,8} Further, Nevares et al.⁹ reported twice the increase in success rate of instrument retrieval when it was visible under a microscope than when not. Yet, removal of fractured fragment from the root canal requires manual skills, equipment, instruments and good knowledge of root canal anatomy.¹⁰ Several complications may occur during

the management of a separated instrument: separation of the ultrasonic tip/file used for bypassing or removing the instrument; further separation of the fragment; perforation; ledge; extrusion of the file into periapical tissues; tooth weakening due to dentin removal, as well as excessive temperature rise in periodontal tissues.

Blockage of the canal, and the resultant loss in working length can be due to packing and solidification of organic debris in the apical region, failure of copious irrigation and/or insertion of debris laden instrument into the canal. This can be prevented using copious irrigation and recapitulating when preparing the canal.¹¹ Management of this situation involves attempting to remove the packed dentine filings and can be achieved by attempting to recapitulate with a small file, whilst using chelating agent. The blockage would have been negotiated by the referral dentist on further attempt but there was concomitant instrument separation with pain and periapical radiolucency on the other tooth. So, the patient was referred to higher center for its management, similar to the finding from the study

by Seonah Kim which showed persistent pain was the most frequent reason for endodontic referral.¹²

CONCLUSIONS

A dentist's professional career has the possibility for making procedural mistakes that could result in unsuccessful treatment. Therefore, it is essential to conduct a thorough examination of the tooth before beginning treatment, and to proceed methodically in accordance with the principles of instrumentation and disinfection of the root canals to avoid any mistakes. In the event of iatrogenic errors, appropriate clinical management and timely referral could help to improve the success of the endodontic therapy.

ACKNOWLEDGEMENTS

The authors would like to thank the patient and all who have, directly and indirectly, supported in completion of the case.

Conflict of Interest: None

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