

# Retrieval of Fractured Rotary Instrument from Root Canal: A Case Report

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## Abstract

Mishaps such as fractured instruments, ledges and perforations are critical procedures faced by clinicians during endodontic treatment. Fractured instrument is a complex condition especially when the file fractures beyond the apex. There is potential risk of contamination associated with such kind of situation, which compromises the healing process. Management of a fractured instrument beyond the apex is difficult and time consuming. Various devices and techniques have been introduced in endodontics for retrieval of the fractured instruments, but none are consistently successful. This case report describes retrieval of fractured instrument separated beyond the apex using the modern ultrasonic tips.

**Keywords:** Fractured, Rotary Instrument, Root Canal.

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## INTRODUCTION

Various unwanted procedural errors at almost any stage of routine endodontic treatment can be faced by clinicians. Among the numerous mishaps, separation of endodontic instruments within root canals is one of the most troublesome incidents [1]. Fractured instruments may comprise endodontic hand or rotary files, sectioned silver points, lentulo spirals, gates glidden drills, a portion of carrier-based obturators, finger spreaders, and paste fillers, or any other instrument left inside the canal [2]. The usage of both nickel-titanium (NiTi) hand files and rotary instruments are the mainstay of chemo-mechanical preparation. The attributable reason could be the much greater flexibility of NiTi files compared to their stainless steel counterparts, which offers distinct clinical advantages in curved root canals [3-6]. There is a potential risk of 'unexpected' fracture with NiTi instruments despite the undeniably favourable qualities. The fractured instruments removal from root canals is very difficult and at times can be impossible, with a reported success rate ranging from 55 to 79%. Instrument fracture during endodontic treatment leads to considerable anxiety, and then all attempts are made to liberate the instrument from the canal non-surgically [7, 8]. Numerous techniques and devices have been described in the literature for retrieving the fractured instrument

fragment with most successful method being the use of ultrasonic along with a dental operating microscope. This case report represents a case of retrieval of a separated NiTi instrument with ET25 ultrasonic tip.

## CASE REPORT

A 35 year old female patient reported to Department of Conservative dentistry and Endodontics with the chief complaint of pain in upper front region of the jaw since 2 weeks. The patient's dental history indicated that the tooth had undergone root canal treatment 1 month back. During clinical examination the tooth was sensitive to percussion and a temporary closed dressing was evident. Intra-oral periapical (IOPA) radiograph was taken and it was revealed that there is root canal treatment performed on the right maxillary central incisor (tooth no. 11) also the separated instrument in the canal extending beyond the apex (Figure-1). Local anaesthesia was administered after rinsing the patient's mouth with 0.2% chlorhexidine and isolation was done with rubber dam. Temporary dressing was taken out and gutta-percha was removed from the canal using H-files, modified Gates Glidden drill (size 3, Dentsply Maillefer, Ballaigues, Switzerland) was used to create a staging platform. After staging, ET25 tip of Endo Success<sup>TM</sup> Retreatment ultrasonic file (Figure-2) was attached to

the ultrasonic device and was activated first at the inner dentinal wall of the canal to create approximately 1.0 mm deep pocket from the severed surface of the file fragment. EDTA solution was introduced in the canal so that the cavitation and acoustic streaming effect of ultrasonics has been enhanced. Ultrasonic vibration was applied and moved in “push and pull” motions between the fragment and the inner wall of the canal until the separated instrument jumped out of the canal. A radiograph was taken to confirm retrieval of the file fragment (Figure-3). The retrieved file fragment was approximately 10 mm long (Figure-4). After instrument retrieval, working length was determined using

radiograph and electronic apex locator (Propex, Dentsply, Maillefer, Ballaigues, Switzerland). Chemo-mechanical preparation was performed using rotary NiTi files (ProTaper, Dentsply Maillefer, Ballaigues, Switzerland). 5.25% sodium hypochlorite and 2% chlorohexidine were used for irrigating the root canals and calcium hydroxide as an intracanal medicament was placed. In the second visit, obturation was carried out by warm vertical compaction technique using gutta percha points (ProTaper, Dentsply, Maillefer, Ballaigues, Switzerland) and Sealapex sealer (Kerr, SybronEndo) (Figure-5). Fiber post was cemented followed by composite restoration.



**Fig-1: Pre-operative radiograph showing fractured instrument extending beyond the canal**



**Fig-2: ET25 ultrasonic tip**



**Fig-3: Radiograph showing retrieval of fractured instrument from the root canal**



**Fig-4: Retrieved file fragment approximately 10 mm long**



**Fig-5: Post-operative radiograph**

## DISCUSSION

The beneficial properties of NiTi alloys are super-elasticity, shape memory effect, and corrosion resistance which have led to their widespread. The properties of the NiTi alloy is due to the result of the austenite to martensite transition. However, the foremost disadvantage of NiTi as compared to stainless steel alloy is its low ultimate tensile and yield strength, making it more susceptible to fracture at lower loads [9, 10]. Endodontic instrument fracture is a mishap that creates a hindrance in the normal routine therapy. The occurrence of broken instruments has increased with the advent of rotary NiTi files. Numerous guidelines have been established to lessen instrument fracture during clinical use. Appropriate training of new techniques and obedience to established principles and guidelines of clinical usage can reduce the incidence of NiTi instrument fracture [11]. In a survey on clinicians in UK it has been reported that 89% had experienced instrument fracture during endodontic procedure. The contributing factors could be incorrect access to the root canal, root canal curvature, repeated use of the same instrument, and the clinicians experience [12]. Non-surgical and surgical are the two approaches recommended for management of cases with fractured instruments. Non-surgical method comprises bypassing

the instrument, removing the instrument or preparation of the canal and obturation to the level of the fractured instrument. As the fractured instrument extended beyond the apex, bypassing the instrument or obturation to the level of the fractured instrument would not serve the purpose. Considering the non-surgical endodontics being the more conservative approach, the retrieval of instrument was attempted [13]. Non-surgical retrieval of fractured instrument is influenced by the diameter, length and position of the fragment within the root canal [14]. Also, the thickness of root dentin, the depth of external concavities and the root canal anatomy are the influential factors in retrieval. Instruments that lie in the straight portions of the canal can be typically removed [15]. Type of material of the fractured instrument also plays an important role in retrieval. NiTi instruments may undergo further fracture due to heat build-up when ultrasonic devices are used for their retrieval whereas the stainless-steel files do not fracture upon removal with ultrasonics. The SS fragments absorb the ultrasonic energy bodily they will show early movement, while in case of NiTi fragments, only the point of contact with the tip absorbs the energy [15]. Various retrieval techniques and devices have been described, including drills, extractors, ultrasonic tips, dental operating microscopes, and electrochemical

processes. Extractors such as the Masseran kit [Micro-Mega, Besancon, France], Endo Rescue kit [Komet/Brasseler, Savannah, GA, USA] are very beneficial for the removal of instrument fragments. There are various alternative techniques being evolved which include the use of injection or hypodermic needles, needle holders, stainless-steel tubes and Hedstrom files, the Canal Finder system, modified spreaders or K-files under ultrasonic vibration, file-removal systems, chloroform-dipped gutta-percha cones, and microtubes with internal screw wedges [16]. In the present case report ultrasonic tip was used due to various advantages in instrument retrieval such as minimal dentin damage and compatible tip designs, which can reach the apical third of the canal. Proper training of new techniques and adherence to the established principles and guidelines of clinical usage can reduce the incidence of NiTi instrument fracture.

## CONCLUSION

In retrieval of the fractured instrument beyond the apex of maxillary right central incisor (tooth no. 11) the ultrasonic technique has proven to be successful.

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