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# Retrieval of Separated Instrument from the Root Canal Using Ultrasonics and File Braiding Technique under Dental Operating Microscope

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**Abstract**
An instrument fracture can lead to serious complications and carries the risk of root canal treatment failure. There are various instrument retrieval kits and chair side techniques are available for this purpose. This is a clinical case report of instrument retrieval from the maxillary second molar using file braiding technique under the surgical operating microscope.

**Keywords**: Instrument Retrieval, File Braiding Technique, Separated Instrument, ultrasonics, Dental Operating Microscope

## INTRODUCTION

The introduction of nickel-titanium (Ni-Ti) alloy by Walia in 1988 revolutionized the way root canals were instrumented. Although widely accepted, these files are more prone to fracture without warning. It has been reported that the separation rates of stainless steel instruments range from 0.25% to 6%, when compared to that of Ni-Ti rotary instruments, which are between 1.3% and 10.0%.(1)

Thorough debridement and sealing of the root canal system is difficult to achieve, when there is a separated instrument. Therefore, attempts should be made to retrieve the broken instrument back. Various dedicated instrument retrieval kits are available, such as the Masserann kit, the IRS kit and the Canal Finder system. Few literatures have relied on chair side techniques such as wire-and-loop method, file braiding technique, hypodermic needle, and glue technique for the retrieval of broken instruments. (2)

The case report presents the successful retrieval of separated Ni-Ti rotary instrument using ultrasonics and canal braiding technique, under a dental operating microscope.

## CASE REPORT

A 37-year-old female patient was referred to our department by a general dentist, for the endodontic management of maxillary second premolar. The patient had been reported with a history of fracture of S1 Ni-Ti rotary file (Protaper Universal system, Dentsply, USA) during cleaning and shaping.

An intraoral periapical radiograph was taken and it showed the presence of a separated instrument (approximately 8 mm length), at the middle and apical third of the canal [Figure 1].

When viewed under the dental operating microscope (Seiler, Operating microscope) at ×8x magnification, after administration of local anesthesia (2% lignocaine hydrochloride with adrenaline 1:80,000) and proper isolation using rubber dam, the coronal portion of the separated instrument was visible, with the fragment

being oriented towards the buccal aspect of the canal and threaded into the dentin.

The fractured fragment was gently bypassed using 10 k file to the full working length (19 mm) and enlarged up to size 30 using K-file ISO size 15 and 17% ethylene diamine tetraacetic acid. [Figure 2]

The instrument was unable to be taken out of the canal by the ultrasonic vibrations (direct and indirect).To free the instrument from dentin, troughing was done on the buccal aspect of the canal. The fractured instrument became loose from the dentin as a result.

The IRS Kit microtube was used to grasp the fragment's freed portion, but it was unsuccessful. As a result, the file braiding technique was adopted to engage the fractured instrument as deep as possible using three new reamers of ISO sizes 15, 25, and 30(Maillefer, Dentsply, USA). The instrument was retrieved from the canal as a result of braiding of these reamers and using a short outward pull.[Figure 3]

During instrumentation, the canal was cleaned and shaped manually (K files, Maillefer, Dentsply, USA), and was enlarged up to ISO size 30 and irrigated with 3% sodium hypochlorite. 17% EDTA and 3% sodium hypochlorite were used in the final irrigation. Absorbent paper points were used to dry the canal, and obturation was done with Guttapercha and AH plus sealer (Dentsply Ballaigues, Switzerland) using a cold lateral compaction technique [Figure 4]. Filtek Z250 resin composite (3M Dental Products, St Paul, MN, USA) was used to restore the access cavity.

During the 4-week follow-up period, the patient was found to be asymptomatic.

**Figure 1**

**Figure 2**

**Figure 3**

**Figure 4**

## DISCUSSION

Due to cyclic or torsional fatigue, a NiTi rotary file may fracture inside the root canal. [3] A number of techniques, including heat treatment, ion implantation, electropolishing, file twisting, metallurgical changes, and newer design features are available [4]. Operator experience, rotational speed, canal curvature, instrument design and technique, torque, manufacturing process, and the absence of a glide path have all been attributed to the fracture of NiTi rotary instruments. In this case, file separation could have been caused by restricted access, improper angulation of the file during use, canal anatomy, and excessive file usage.

Instrument separation within the canal can be effectively managed by either bypassing it or retrieving it. [3] In this case, however, retrieval was attempted, since the file had separated at an early stage of cleaning and shaping, and accessibility was improved using illumination and magnification (DOM).

The Masserann Kit, Cancellier Kit, IRS Kit, Canal Finder, Endo rescue, and Mini forceps are all specialist instrument retrieval kits that function by releasing the



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fragment from surrounding dentin and grasping it with a microtube. Terauchi recently developed a new file retrieval kit that claims to remove only a small amount of dentin.

It differs from other retrieval kits since it includes a modified GG drill # 3, a FRKT microtrephine bur for creating a staging platform down to the separated fragment, and a concave spoonshaped ultrasonic tip FRK6 and a microlasso for grasping the fragment.

These devices, however, are not easily available, are very expensive, and usually require the removal of a significant amount of dentin, which can weaken the roots. To overcome the problem of excessive dentin removal, a few authors have suggested using specialized ultrasonic tips under DOM. High-powered magnification allows for precise use of ultrasonic, eliminating excessive dentin removal and increasing the success rates by 67% to 95 %. (5)

The fractured instrument was bypassed in this case, and ultrasonic vibrations were transmitted.

To free the dentin surrounding the fragment, ultrasonic troughing was done on the buccal aspect of the fragment using the ET25 tip. The instrument retrieval system was then employed to grasp the freed coronal portion of the separated fragment; however, this was not possible because the microtube's tip diameter was less than the separated fragment's coronal end. As a result, file braiding technique was employed in this case to retrieve the fragment using three new reamers of various sizes that were braided and a short outward stroke.

There are other innovative techniques that have been tested in vitro for this purpose. Ormiga et al. designed and evaluated a new concept based on electrochemically induced metal dissolution.[6] Wohlgemuth et al. have investigated the effectiveness of a novel gentle wave irrigation system that uses a multisonic ultracleaning approach to retrieve the fractured instruments.

It is best to avoid instrument separation because retrieving them takes time, has the potential for complications, and increases the patient's anxiety level. Instrument separation can be avoided by using accurate straight-line access, using Ni-Ti rotary files at the manufacturer's recommended settings, using Ni-Ti rotary files only once, and having a sufficient glide path before Ni-Ti instrumentation.

## CONCLUSION

Under the surgical operating microscope, the NiTi rotary file was successfully retrieved in the maxillary second premolar using ultrasonic tips and canal braiding approach.

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