

**ULTRASONIC-ASSISTED RETRIEVAL OF A SEPARATED ENDODONTIC FILE: A  
CASE REPORT****<sup>1</sup>Dr. Kailash Attur, <sup>2</sup>\*Dr. Palak Chhaya, <sup>3</sup>Dr. Nikunj Patel and <sup>4</sup>Dr. Manali Parmar**<sup>1</sup>Professor and HOD, Department of Conservative Dentistry and Endodontics, Narsinhbhai Dental College and Hospital, Visnagar.<sup>2,4</sup>Post Graduate Student, MDS, Department of Conservative Dentistry and Endodontics, Narsinhbhai Dental College and Hospital, Visnagar.<sup>3</sup>Professor, MDS, Department of Conservative Dentistry and Endodontics, Narsinhbhai Dental College and Hospital, Visnagar.**\*Corresponding Author: Dr. Palak Chhaya**

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Article Received on 20/05/2025

Article Revised on 10/06/2025

Article Accepted on 30/06/2025

**ABSTRACT**

Separation of endodontic instruments during root canal treatment is a frequent and challenging procedural mishap. Such occurrences hinder effective cleaning and shaping of the root canal system and may compromise treatment success due to potential bacterial contamination. The retrieval of fractured instruments is often difficult, time-consuming, and requires both clinical skill and appropriate armamentarium. Recent advancements, particularly the use of ultrasonics under magnification, have improved the predictability and safety of such procedures. Ultrasonic tips allow conservative removal by precisely targeting the separated fragment without extensive damage to the canal walls. This case report presents the successful retrieval of a fractured file using ultrasonic techniques and magnification.

**KEYWORDS:** Endodontic mishap, File retrieval, ultrasonics.**INTRODUCTION**

During root canal treatment, clinicians face various unwanted procedural mishaps that can occur at any stage of treatment. Of all, instrument fracture within the root canal system and more rarely fractured piece protruding beyond the apex are among the most troublesome and frustrating errors.<sup>[1]</sup> Instrument separation during endodontic treatment presents a significant clinical challenge, with studies reporting its occurrence in approximately 2% to 6% of cases.<sup>[2]</sup> Rotary nickel titanium (NiTi) files are extensively used for cleaning and shaping of the root canals because of their higher flexibility compared to stainless steel (SS) files. Despite the superior qualities of NiTi rotary files, there is always a potential risk of breakage of NiTi instruments without visible warning.<sup>[3]</sup>

Management of separated endodontic instrument includes (a) bypassing the broken fragment, (b) debriding and obturating at the level of separated instrument, and (c) removal of the separated instrument. Retrieval of fractured instruments is usually very difficult and impossible at times, with a reported success rate of 55 to 79%<sup>[1]</sup>. Several devices and techniques have been introduced for retrieval of separated instruments such as Ruddle IRS<sup>TM</sup> (Dentsply, Tulsa, OK, USA),

Masseran<sup>TM</sup> Endodontic Kit (Micro-Mega, Lynnewood, Washington, USA) and the Cancellier Instrument Removal System<sup>TM</sup> (SybronEndo, Orange, CA, USA). Newly developed ultrasonic tips used with piezoelectric ultrasonic units are used for conservative removal of dentin surrounding the separated instrument; moreover, their vibrations facilitate the removal of fractured instrument.<sup>[4]</sup>

Studies have shown that use of ultrasonics with magnification has led to high success rate of retrieval of the separated instrument. This report describes a clinical in which ultrasonic technique was used to remove fractured instruments from the root canals under magnification.

**CASE REPORT**

A 35-year-old female patient reported in the Department of Conservative Dentistry and Endodontics of our institute with the chief complaint of pain in relation to upper right tooth. She gave a history of root canal treatment with the same tooth at a private clinic, 2 months back and was having pain since then. Clinical examination showed temporary restoration with left maxillary lateral incisor. Intraoral periapical (IOPA) revealed a fractured instrument at the middle third of the

root canal of 22 and the canal were not obturated. There was no periapical radiolucency associated with the tooth. Retreatment aiming to retrieve the separated instrument was planned, and the patient was explained about the treatment plan and consent obtained.

After removal of the temporary restoration access, opening was enlarged. Gates Glidden (GG) drills no.2 and 3 (Dentsply Maillefer, Ballaigues, Switzerland) were modified by cutting the drill perpendicular to the long axis at the greatest cross-sectional diameter. Modified GG drills were used to prepare a staging platform, and coronal part of the broken instrument was exposed by removing the surrounding dentine. After staging, ET25 tip of Endo Success™ Retreatment kit was attached to the ultrasonic device and was activated first at the inner dentinal wall of the canal to create a tiny pocket approximately 1.0 mm deep from the severed surface of the file fragment. Once this narrow space was obtained, a shallow groove was cut along the outer dentinal wall

such that there was no obstruction to keep the fragment from being pulled coronally. Ultrasonic vibration was applied to the separated file in the space created between the fragment and the inner wall of the canal, and moved in "push and pull" motions until the separated instrument jumped out of the canal. A radiograph was taken to confirm retrieval of the file fragment.

After instrument retrieval, working length was determined using an apex locator (Root ZX mini, J MORITA) and radiographs were taken. The root canals were cleaned and shaped using rotary NiTi files (Hyflex CM, Coltene). Next, 2.5% sodium hypochlorite and 2% chlorhexidine were used for irrigating the root canals and calcium hydroxide was paced as intracanal medicament. In the second visit the canal was obturated and access cavity was restored with composite. The patient was referred further for permanent coronal restoration.

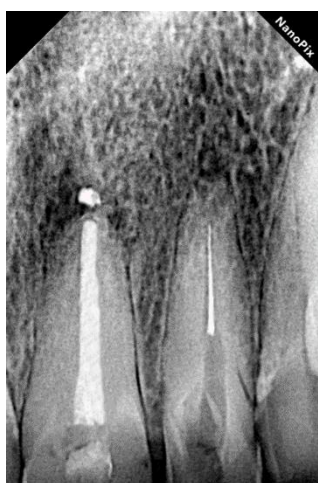


Figure 1: Pre operative radiograph

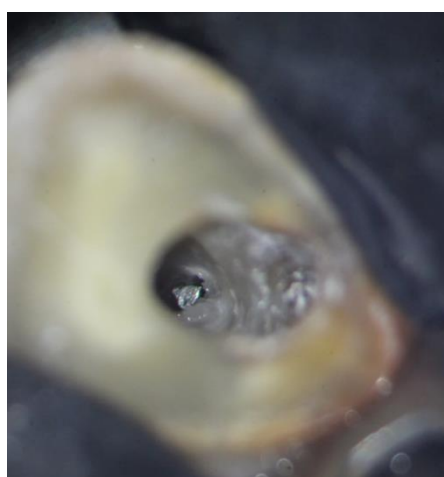


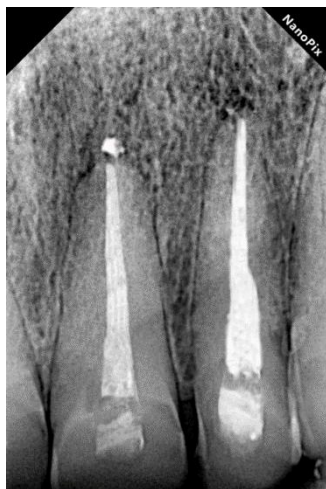
Figure 2: Image of separated instrument viewed under magnification



Figure 3: Post retrieval radiograph



Figure 4: length of separated instrument



**Figure 5: Post operative radiograph**

## DISCUSSION

One major challenge in root canal cleaning and shaping is the separation of instruments within the canal, which can block access to the apex. This complication poses a risk to the overall success of endodontic treatment and reduces the chances of a successful retreatment. The prognosis in such situations depends on several factors, including the condition of the root canal (whether vital or nonvital), the clinical status of the tooth (presence or absence of symptoms and periapical pathology), the extent of cleaning and shaping completed before the separation, and the location of the fractured instrument within the canal.<sup>[4]</sup> Nickel-titanium (NiTi) rotary files are now widely used for the cleaning and shaping of the root canal system. The inherent characteristics of the NiTi alloy of superelasticity and resistance to torsional failure have allowed clinicians to efficiently obtain predictable results with nonsurgical endodontic treatment. One of the most dreaded complications of the use of NiTi files is separation of the instrument during use, which can cause further procedural errors in endodontic therapy. The incidence of fractured rotary NiTi files, based on only a small number of recent investigations, has been shown to be in the range of 0.4% to 4.6%.<sup>[7]</sup>

The root canal's length, curvature, and diameter of its cross-section; thickness of dentin and root morphology; the instrument's content and cutting action (counterclockwise or clockwise); and the location, length, and degree of binding of the instrument within the canal are among the variables that affect orthograde retrieval.<sup>[5]</sup> Three instrument retrieval strategies exist, including chemical, mechanical, and surgical techniques. Chemical methods that corrode the fractured metallic instrument with solvents such as nitric acid, sulfuric acid, iodine trichloride, hydrochloric acid, and iodine crystals or dissolve the instrument electrochemically using electrolyzed solutions of sodium chloride or fluoride are inefficient for retrieving instruments because they take a significant amount of time to dissolve the metallic instrument completely.<sup>[6]</sup>

Mechanical techniques for retrieving separated instruments typically involve two key steps. The first step focuses on preparing the root canal using ultrasonic or rotary tools to loosen the fractured instrument. The second step involves the actual retrieval of the instrument, using either ultrasonics or specialized retrieval devices. These mechanical methods are generally categorized into two types: one approach employs trephine burs to cut around the perimeter of the separated fragment during the preparation phase, followed by removal attempts using retrieval tools; the other approach involves creating a small space on one side of the broken instrument using ultrasonics or specific files, then attempting retrieval with loops or specially designed instruments included in these systems.

In the present case the separated instrument was present in the straight portion of the posterior teeth and most of it was present within the canal, we employed the nonsurgical mechanical method and used ultrasonics for its retrieval. Ultrasonic retrieval was chosen in our case due to its several advantages, including minimal damage to dentin and the availability of specially designed tips that can effectively used to remove fractured fragment. However, it is important to recognize that the use of rotary NiTi instruments has led to a higher incidence of instrument separation, particularly among less experienced practitioners. To minimize the risk of NiTi file fracture, it is essential to ensure proper training in these techniques and strict adherence to established clinical protocols and guidelines.

## CONCLUSION

Instrument separation during root canal treatment remains a challenging complication that can compromise the prognosis of endodontic therapy. This case highlights the successful nonsurgical retrieval of a separated instrument using ultrasonic techniques under magnification. Ultrasonics offer a conservative and effective approach, especially in straight canals. Proper training and adherence to clinical protocols are essential

to prevent instrument separation and ensure optimal endodontic outcomes.

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