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Retrieval of a File from Different Positions of Root Canal: A Case Report

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ABSTRACT
Instrument separation is one of the most common procedural complications encountered during endodontic therapy. It occurs when a file or other endodontic tool fractures within the root canal system during instrumentation, hindering complete debridement and shaping of the canal. This obstruction can compromise treatment outcomes by preventing adequate disinfection beyond the separated instrument.
When faced with a separated instrument, the clinician must assess the situation and consider all possible management strategies. These may include attempting to remove the fragment, bypassing it, or leaving it in place.The decision depends on multiple factors such as the location of the fragment, root canal anatomy, at which stage of treatment separation has occurred and the availability of an instrument retrievalkit. The instrument can be removed using the braiding technique, ultrasonics, and different retrieval kits. This paper aims to suggest a combination of techniques for the retrieval of files from the middle and apical third of the canal.
KEYWORDS: instrument separation, bypass, retrieval, braiding, ultrasonics.

I. INTRODUCTION

Instrument separation (SEI) during root canal treatment is a significant procedural complication that can compromise canal disinfection and long-term treatment outcomes. Nickel-titanium (NiTi) instruments offer superior flexibility and cutting efficiency but are more prone to fracture than stainless steel files, primarily due to cyclic fatigue and torsional stress. Reported separation rates range from 0.13% to 10% for rotary instruments and 0.25% to 6% for hand files.[1]As per the incidences in teeth,mandibular molars have the highest separated instruments(%),followed by 42.6% in the maxillary molars and very few cases in anteriors.[2]

Recent innovations in file design—including heat-treated NiTi alloys, variable taper, and reciprocating motion—have helped reduce fracture rates, with reciprocating systems showing a lower incidence (1%) than continuous rotary systems (2.43%).[3]

Management of SEIs depends on the location of the fragment, canal anatomy, available equipment and operator skill. Strategies include bypassing the fragment, removal using manual techniques or specialized retrieval kits (e.g., Masserann, IRS, Terauchi), or ultrasonic techniques under a dental operating microscope, which offer 67–95% success rates, in cases where removal poses risks due to apical separation, and in cases where it happens after canal disinfection.Obturation short of the fragment may be considered.[4 20]

Preventing SEI through proper technique and recognizing high-risk scenarios remains essential for successful endodontic therapy.[1]

Case Report 1

A 35-year-old female was referred to the Department of Endodontics, Himachal Institute of Dental Sciences, Paonta Sahib, by her local dentist to manage a case of root canal treatment with a separated instrument in tooth #46.The patient presented with discomfort and sensitivity in the lower right posterior region. Clinical examination

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revealed tooth #46 with an existing access cavity sealed with temporary restorative material and tenderness to percussion. No signs of swelling or sinus tract were noted. An intraoral periapical radiograph confirmed the presence of a fractured file fragment in the apical third of the mesial canal.

Canal orifice enlargement was performed using Gates Glidden drills up to size 3 to initiate treatment for removing a separated instrument. A size 10 K-file bypassed the fragment, followed by sequential use of size 15, 20, and 25 K-files. Irrigation with EDTA and normal saline was carried out after every instrumentation. During this procedure, a radiograph revealed slight coronal movement of the separated instrument. Retrievalwas attempted using a size 25 H-file in a brushing motion to loosen the fragment and move it coronally. Ultrasonic activation using Dr. Talal's Endo Kit, specifically the T6 tip, in a pecking motion, was employed around the fragment, followed by ProTaper S1 in a brushing motion along the separated instrument to loosen the fractured instrument in the canal.It was followed by activation using an ultrasonic irrigation tip, and the separated instrument wassuccessfully retrieved from the canal. Figure1.D shows a radiograph of tooth 46 after retrieving the file from the apical third.

Following retrieval, biomechanical preparation (BMP) of the mesiobuccal canal was completed up to ProTaper F3, while the mesiolingual, distobuccal, and distolingual canals were prepared up to ProTaper F2. Irrigation withNaOCl and saline was continued along with instrumentation. A mixture of calcium hydroxide and chlorhexidine was placed as intracanal medicament, and the patient was recalled after one week. At the follow-up visit, canals were irrigated and dried, and a master cone radiograph was taken to confirm proper fit. Obturation was completed using the lateral compaction technique with gutta-percha and accessory cones, followed by post-endodontic restoration with composite.The patient was recalled after one week.There was no sign of tenderness, so it was planned for further treatment for the placement of a crown.

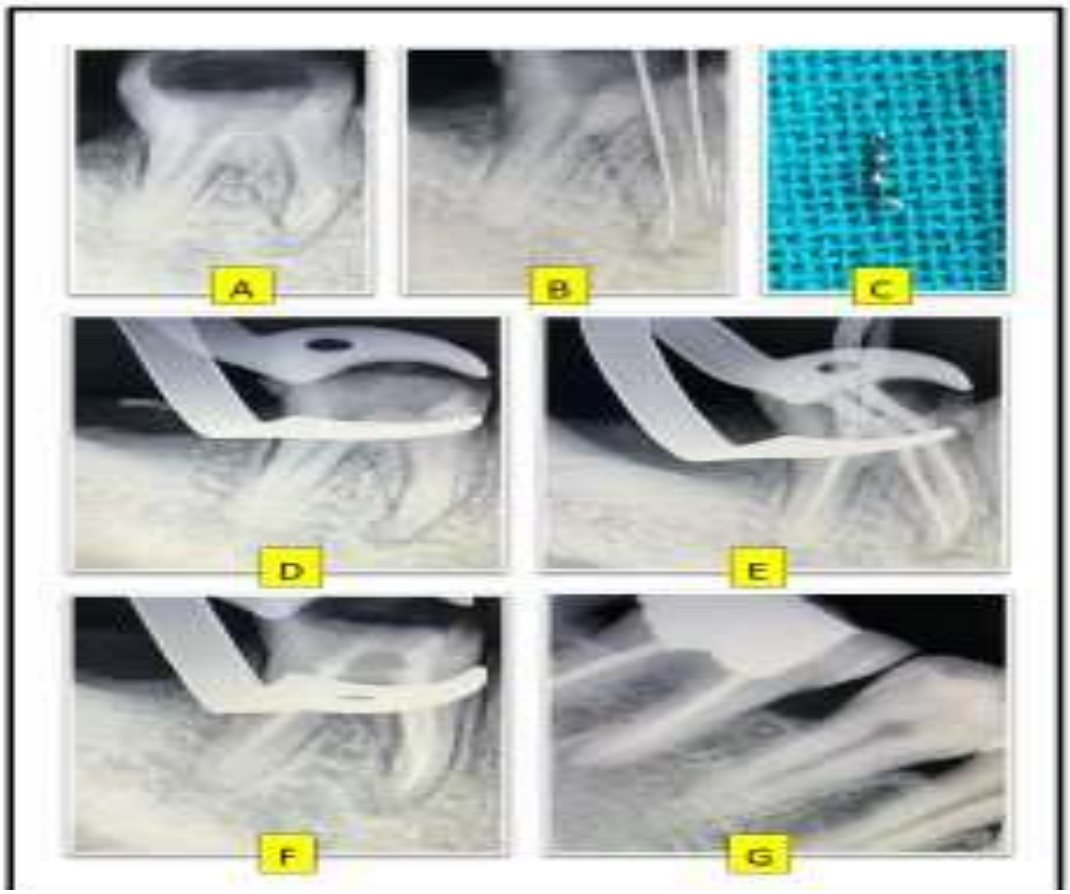

Figure 1. A. Tooth 46 ,file separation in the apical third of the mesial canal B.25K file bypassed the separated instrument C. Instrument retrieved D. After retrieval of instrument. E. Master apical radiograph F. obturation done. G. Post endodontic restoration.

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Case Report 2

A 47-year-old female patient presented to the Department of Conservative Dentistry and Endodontics at Himachal Institute of Dental Sciences, Paonta Sahib, with pain in the right mandibular first molar (tooth #46). The patient reported having undergone root canal treatment for the same tooth two months earlier. Clinical and radiographic examination, including an intraoral periapical radiograph, revealed a separated endodontic instrument located at the junction of the coronal and middle third of the distal canal. Additionally, a periapical radiolucency was noted concerning the mesiobuccal and mesiolingual roots.

The tooth was isolated under a rubber dam. The existing access cavity was modified, and the distal canal orifice was enlarged using Gates Glidden drills sizes 1 to 3 (Dentsply, Switzerland) to provide straight-line access to the coronal area ofthe separated fragment. Troughing was performed around the separated instrument using an ultrasonically activated tip (T6) mounted on a WOODPECKER UDS-P LED piezo ultrasonic scaler under continuous irrigation to free the coronal end of the fragment.

The fragment was bypassed using an ISO size 15 K-file in combination with 17% EDTA. The file reached full working length (25 mm), and the canal was further enlarged to size 30 to create space between the fragment and the canal wall. Hedström filing was performed along the length of the fragment with a size 30 H-file, accompanied by continuous irrigation using 17% EDTA and ultrasonic activation. The file was successfully retrieved.The radiograph confirmed complete retrieval of the separated instrument from the distal canal.

Subsequently, working lengths were established in all four canals—mesiobuccal, mesiolingual, and distal canal—and confirmed radiographically. Calcium hydroxide mixed with chlorhexidine was placed as an intracanal medicament, and the access cavity was temporarily sealed with Cavitafter placement of sterile cotton in the chamber.

At the subsequent appointment, biomechanical preparation was completed using ProTaper files. The mesiobuccal and mesiolingual canals were prepared up to protaper F2, and the distal canal was prepared up to protaperF3.Thorough irrigation was done throughout the procedure using 2.5%NaOCl and saline. Final irrigation was done using 17% EDTA. Canals were dried, and a master cone radiograph was taken to confirm a snug fit. Obturation was performed using the lateral compaction technique with Protapergutta-percha cones and 2% taper accessory cones, followed by post-endodontic restoration.

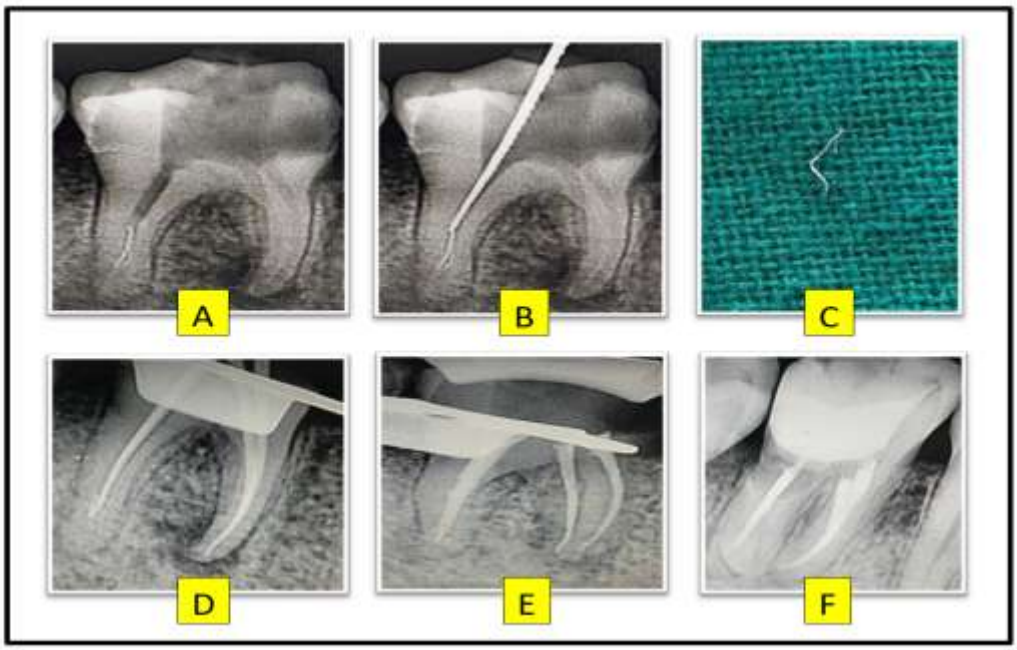

Figure 2. A. file separation in the coronal and middle third of the distal canal of 46. B. Troughing done around the coronal end of the separated instrument using T6 ultrasonic tip.C.Retreival of file done. D. Master apical radiograph E. Obturation done. F. post endodontic restoration done.

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Case Report 3

A 47-year-old female reported to the department of conservative dentistry and endodontics, Himachal Institute of Dental Sciences, Paonta Sahib, with swelling and discharge of pus on the labial surface in relation to her maxillary left central incisor. The patient had pain in this tooth when she went to a local dentist.She developed swelling and discharge of pusfollowing root canal treatment of the maxillary left central incisor by a local dentist.

On clinical examination, the tooth was seen with a temporary filling. Radiographshowed a radiolucent area around the apex, and the separated instrument was seen wedged beyond the apex of the maxillary left central incisor.An attempt was made to retrieve the separated instrument. To retrieve the instrument,the canal was irrigated with 17% EDTA. Initially, one H-file was used to bypass the broken tip, followed by another H-file, which was inserted gradually. Then, these files were rotated under copious irrigation to grasp and pull out the fragment. Repeating this procedure engaged the fragment, and it was withdrawn. A radiograph was taken to confirm its complete removal, as shown in Figure 3.D.

After confirmation of working length, the root canal was prepared per the standardized technique using 0.02 taper stainless steel instruments. Filling was continued sequentially till 50K file then recaptulating it using step back preparation.Final circumferential filling was done with a 50H file,followed by calcium hydroxide dressing.In the 2nd visit, calcium hydroxide was removed,a master apical radiograph was taken, followed by drying of canals,and obturation was done with 2%Gutta-perchaby the lateral condensation method using zinc-oxide sealer. A final radiograph was taken after obturation.

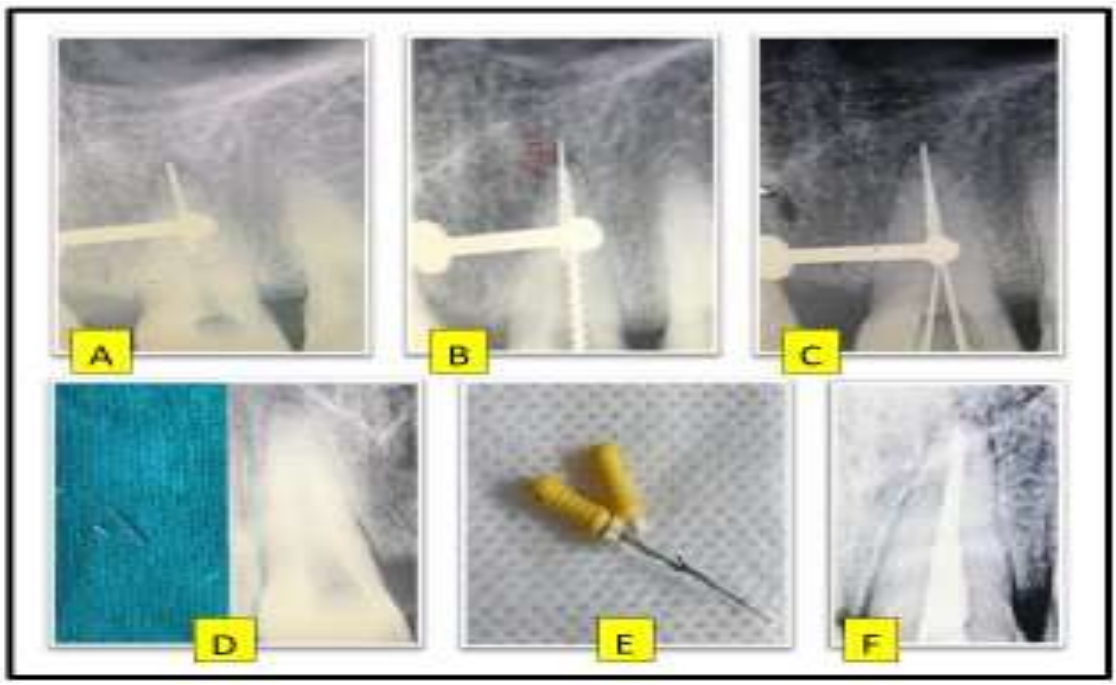

Figure 3. A. Instrument separation beyond the apex. B. separated instrument bypassed subsequently with H Files C. Two H Files engaging the fractured instrument D. Instrument retrieval done. E. File Braiding technique F. Biomechanical preparation followed by obturation.

Case Report 4

A 37-year-old female reported to the department of conservative dentistry and endodontics, Himachal Institute of Dental Sciences, PaontaSahib, with pain and discharge of pus on the labial surface concerning her mandibular left lateral incisor(tooth #32). The patient had pain in this tooth when she went to a local dentist. Following root canal treatment of the mandibular left lateral incisor, she developed swelling, discharge of pus on the labial surface and the pain aggravated.

Radiograph showed a slight radiolucency around the apex, and the separated instrument was wedged beyond the apex of the mandibular left lateral incisor. An attempt was made to retrieve the separated instrument. The tooth was anaesthetised using 2% lignocaine hydrochloride with 1:100,000 adrenaline. The existing access cavity was

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modified and enlarged using Gates Glidden drills sizes 1 through 3 (Dentsply, Switzerland) to provide straight-line access. The fragment was bypassed using an ISO size 15 K-file in combination with 17%EDTA. The canal was further enlarged to a size of 45 to create space between the fragment and the canal wall. Hedstrom filing was performed along the length of the fragment with a size 45 H file, accompanied by continuous irrigation using 2.5% sodium hypochlorite and saline. The separated instrument, which was beyond the apex, slightly moved upwards. Ultrasonic activation using Dr. Talal's Endo Kit, specifically the T6 tip, in a pecking motion, was employed around the fragment, along with Pro Taper S1 in a brushing motion to facilitate removal. The separated instrument was successfully retrieved—Figure 4.E shows a radiograph of tooth 32 after retrieving the file.

Following retrieval,a rubber dam was placed, the working length was determined, and biomechanical preparation was completed up to size 55 K using the step-back technique. Calcium hydroxide and chlorhexidine were placed as intracanal medicament. The patient was recalled after one week. At the follow-up visit,canals were irrigated and dried, and a master cone radiograph was taken to confirm proper fit. Obturation was completed using the lateral compaction technique with 2% gutta-perchaand accessory cones, followed by post-endodontic restoration.

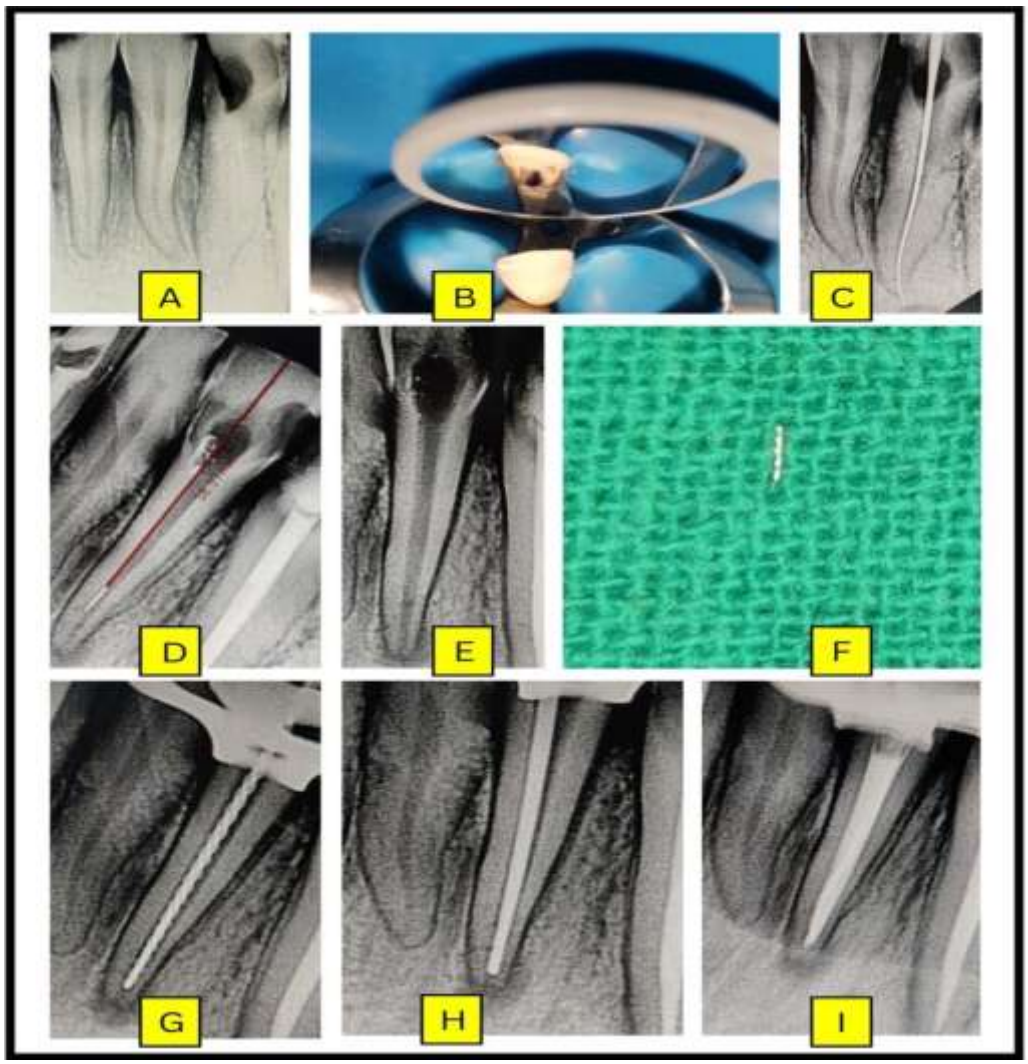

Figure 4. A. Instrument separation beyond the apex. B.Enlarged access cavity using GG drills. C.15 K file bypassed the separated instrument D. After H filing file moved upwards. E. After retrieval of instrument F. Instrument retrieved G. working length determination. H. master apical radiograph I. Obturation using lateral compaction technique.

II. DISCUSSION

Unwanted procedural mishaps can occur at any stage during root canal treatment, with instrument separation being one of the most common and frustrating complications.[8] Among these, separation of an instrument within the root canal system—particularly in the apical third region—and more rarely, the protrusion of a separated fragment beyond the apex, are considered especially troublesome.[9 15]

A separated instrument extending beyond the apex poses significant concern for the patient and the clinician. Several techniques and instrument retrieval systems have been proposed for managing such cases.[19] However, no method can guarantee 100% success, nor can any be regarded as the definitive gold standard for instrument retrieval.[10 14]

Uddin et al had a conservative approach for removing a fractured instrument located at the apical root area of the maxillary left central incisor of a 35-year-old male using the file braiding technique, and the file was successfully retrieved.[3]

Glii W, et al. titled "Broken File Retrieval in the Lower Left Second Molar Using the Ultrasonic Technique," details the successful removal of a separated endodontic file from a mandibular molar using an ultrasonic device under a dental operating microscope.[6]

Management options for separated instruments typically include orthograde (non-surgical) approaches and surgical intervention in more complex cases.[11] The choice between these two strategies depends on several factors, including the location of the fragment, root canal anatomy, accessibility, and the overall prognosis of the tooth.[12 13]

Due to various advantages advocated in literature studies of ultrasonics in instrument retrieval, such as minimal dentin damage and compatible tip designs, which can reach the apical third of the canal, ultrasonic retrieval was successfully attempted in our case reports 1,2 and 4.[17]

In Case Report 3, the conventional braiding technique was used because it was possible to obtain a straight line access to the coronal end of the separated instrument without creating any staging platform, and the separated fragment was also bypassed.[5]This technique consists of inserting multiple H-files and twisting them around the foreign body, which is reported in endodontic literature. Since their flute design is suitable for engaging the foreign body, they would exert a gripping force that would ultimately aid in removing the fractured instrument.[5]

III. CONCLUSION

A proper treatment plan is a must for any instrument retrieval from the root canal before initiation of the $_{\text{treatment}}$. Though literature offers several procedures that can assist instrument retrieval, choosing a protocol beneficial for that particular case is essential. Thus, this case report uses a combination of techniques for instrument retrieval.[7 18]

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