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Case Report

File retrieval with sonics: A retreatment case report

Navneet Kaur^{1,*}, Vineeta Nikhil¹, Sachin Gupta¹, Shalini Rai¹, Somya Vats¹

¹Dept. of Conservative Dentistry & Endodontics, Subharti Dental College & Hospital, Meerut, Uttar Pradesh, India



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ABSTRACT

Background: Instrument separation is one of the most stressful endodontic mishaps, that can occur any time during the root canal treatment. Several techniques have been employed to facilitate instrument retrieval, however, most of them are technique sensitive, expensive and require great expertise.

Aim: Through this paper, an economic and convenient technique is suggested to retrieve the fractured segment with a combination of both hand files and sonic agitation.

Materials and Methods: A 35 year old male patient presented with pain in lower anterior tooth region. Clinical examination revealed an intact PFM (Porcelain fused to metal) crown in 31 with no soft tissue abnormality and radio-visio-graph indicated a fractured H-file fragment extending from the apical third to 2 mm beyond the radiographic apex with an associated radiolucency. Thus, a retreatment aimed at retrieval of the fractured instrument followed by obturation and post endo restoration was planned without removing the fixed prosthesis.

Conclusion: It was possible to successfully remove broken file from the root canal using Sonic agitation coupled with H files with minimal damage to radicular dentin.

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1. Introduction

The intriguing anatomical variations of root canal not only increase the complexity of treatment but also predispose the procedure to a wide range of iatrogenic complications like missed canals, instrument separation, gouging, perforation and overextension of the obturation materials. One such undesirable event is the breakage of an instrument, which may hinder the cleaning and shaping procedures resulting in continuous pain or discomfort. As a consequence, the prognosis of an endodontic therapy declines considerably.

Clinical data suggests that the probability of separation of an instrument in a root canal during chemo-mechanical preparation is 2%–6%.¹ There are various reasons for instrument separation such as over-instrumentation, improper filing techniques, inadequate access, lack of

understanding of root canal anatomy and possibly manufacturing defects.² The fracture of rotary files is usually caused by torsional stress and cyclic loading while stainless steel hand files fracture due to excessive torque application during instrument manipulation.

The retrieval of instruments has no sure short formula, in fact it is a hit and trial method. The choice of any particular technique is made after critically evaluating the pros and cons of each technique. Different techniques have been described to retrieve the obstruction from canal including the Masserann kit, IRS kit, the Endosicherheits system, the braiding technique, ultrasonics, the combined technique, the wire loop technique and the endo-extractor technique, yet none of them is completely effective.^{3,4} This case report discusses the retrieval of an H-file, fractured in the apical third of 31 extending 2 mm beyond the apex by a combination strategy.

* Corresponding author.

E-mail address: endo8navneet@gmail.com (N. Kaur).

2. Materials and Methods

A 35-year-old man reported to the Department of Conservative Dentistry and Endodontics, with a chief complaint of pain in the lower front teeth for which the patient had undergone previous dental treatment, but with no relief in pain. The patient gave a history of root canal treatment in the same at a private clinic 6 months back. The tooth was restored with an intact Porcelain Fused to Metal crown and was sensitive to percussion but showed normal mobility and probing depth with no signs of soft tissue injury or swelling in the affected area. Thermal tests were not performed because access had already been carried. An intra-oral periapical radiograph showed a peri-apical radiolucency wrt 31 with Gutta Percha (GP) like fragment lodged in the middle third of the canal along with a separated H file extending from the apical third to approximately 2mm beyond the radiographic terminus. The treatment plan aimed at retrieval of GP fragment and H file followed by root canal treatment. Since, the crown was intact, an access cavity was made through the crown.

Under rubber dam isolation, an access cavity was made in two steps. Firstly, the porcelain was trimmed with a #801-016 diamond (Piranha, S.S. White, USA) under water coolant to expose the metal coping following which an access cavity was prepared with a Great White #6 surgical length bur. Then, a #856-016 Diamond (Piranha, S.S. White, USA) was used to flare the wall for adequate working space with proper visibility.

A # 20 K-File (Dentsply/Maillefer, Ballaigues, Switzerland) was introduced passively into the canal till it reached the cervical part of the fractured file. Then, a # 30 H- file was used to remove the fragment of GP lodged in the middle third of the canal following which, the cervical and middle thirds of the canal were flared with S1 and S2 files (Dentsply/Maillefer, Ballaigues, Switzerland).

From this point on, a pre-curved # 20 K-file instrument was passively introduced up to the cervical segment of the fractured file and introduced laterally by means of longitudinal and rotational movements. After the successful process of bypassing the fractured instrument with # 20 and # 25 K-file respectively, the working length was determined with apex locator and confirmed radiographically. The biomechanical preparation (BMP) was done manually with K- files and the canal was enlarged up to ISO size 40 and irrigated with 2.5% sodium hypochlorite during instrumentation. The step back technique of BMP was performed till 60 K-file.

Once the orifice was visible, the cervical and middle thirds were prepared with SX, S1 and S2 files (Dentsply/Maillefer, Ballaigues, Switzerland). Then, with the help of the file braiding technique, the fractured instrument was engaged as deep as possible with the help of three new H-files of ISO sizes 15, 20, and 25 (Maillefer,

USA). The H-files were inserted, buccal and lingual to the separated fragment and then the files were braided in the clockwise direction, in order to engage the file segment inside the canal. After giving a clockwise turn, they were pulled out of the canal. This technique was done for several times till the instrument got disengaged from the apical foramen and moved into the middle third of the canal.

The canal was then irrigated with saline in conjunction with sonic agitation using an endo-activator (Dentsply, Tulsa Dental Specialties, Tulsa, OK, USA) at a speed of 6,000 cycles per minute for 3 minutes. In this process, the separated instrument vibrated into the access cavity and was retrieved with a tweezer. A calcium hydroxide dressing was packed in the canal and the patient was recalled after 1 week.

On recall after one week, patient was asymptomatic, hence obturation was performed by Cold Lateral Compaction technique using Gutta-percha and AH plus sealer (Dentsply Ballaigues, Switzerland) and the access cavity was sealed by a composite restoration.

3. Discussion

Machtou & Reit 2003 suggested that when an instrument fractures, the best approach is to retrieve it.⁵ However, the literature reports no standardized protocol that can be followed to remove a fractured instrument from the root canals. Although, various specialized instrument-retrieval kits and systems are available, they have their own limitations like excessive removal of root canal dentin, ledging, perforation, limited application in narrow and curved roots, and extrusion of the fractured portion through the apex.⁶ Hence, the clinician has to evaluate the options of attempting to remove the instrument, bypassing it or leaving the fractured portion in the root canal. Rocke & Guldener suggested an array of factors to be considered before decision making such as the pulp status, presence of peri-apical infection, the canal anatomy, the position of the fractured instrument and the type of the fractured instrument.⁷

Literature proposes that it is difficult to bypass the fractured instrument, particularly in cases where the fragment is restricted in the apical one-third of canal or beyond the canal curvature as its removal may lead to unnecessary removal of dentine.⁸ In the present case, the separated file was not only lodged approximately 2mm beyond the radiographic apex and but also associated with a peri-apical pathology as well. There are several orthograde as well as surgical approaches for the management of separated endodontic instruments extending into the periapical area. Retrieval was essential in this case as the patient was symptomatic. It was decided to implement a non-surgical approach prior to an invasive therapy.

Shen and his co-workers concluded that single rooted teeth and those with uncomplicated root canal anatomy

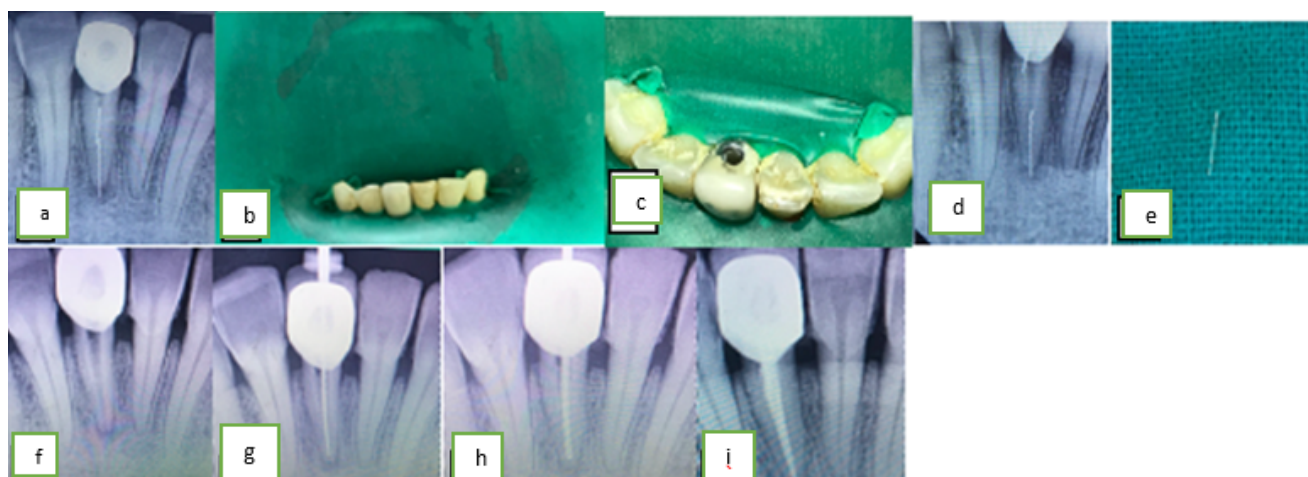


Fig. 1: **a:** Preoperative radiograph; **b:** Rubber dam isolation; **c:** Access cavity prepared through the crown; **d:** GP removed, tip of fractured instrument extending into peri-apical space; **e:** Fractured H- file retrieved from the canal; **f:** Separated file tip retrieved; **g:** Working length taken; **h:** Master cone radiograph; **i:** Obturation radiograph

(example: incisors, canines, palatal roots of maxillary molars) have a higher success rate for of removal than for posterior teeth canals, which are narrow and curved.⁹ In addition, B. Suter and co-workers reported that stainless steel instruments were easier to remove as compared to flexible Niti instruments while Hülsmann and Schinkel proposed that longer fragments would be easier to remove than short fragments.^{10,11}

However, Suter et al. (2005) demonstrated a lower probability of retrieval for the cases when the fragment was to be removed from the apical third than from the medium or coronal third.¹⁰ Furthermore, the file separated in this case was an H-file which according to Himel VT, Levitan ME is more challenging to retrieve as they have larger helix angle, deeper flutes, and greater positive rake angle resulting in greater engagement with root canal wall.^{8,12}

Hence, all these factors were contemplated and finally removal was attempted non surgically as it would improve working length control and facilitate effective obturation of the root canal system. A non-surgical removal was preferred over surgical removal as surgery is invasive, requires considerable skill and may reduce the crown-root ratio of the tooth.

PFM crowns are preferred by many clinicians as they are economic, structurally durable, have high aesthetic quality and good wear compatibility to opposing teeth. In the case described, the crown was given 3 months back, hence it was desirable to maintain that crown for an extended time as it showed no signs of damage. It was decided to seal the access cavity with nanohybrid composite in accordance with a retrospective study conducted by Wiegand & Kanzow to analyse the effect of repair of endodontic access cavities with dental composites on the survival of single crowns. They concluded that repairing

access cavities with composite increases the longevity of single crowns with a survival rate as long as 10 years.¹³

In the present case reports, a conservative approach was planned to remove the file segment to preserve the root canal dentin as the tooth involved was a mandibular incisor which is narrower mesio-distally, thus prone to perforations. Since, 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, the conventional braiding technique was employed initially but the braiding technique in this case could only disengage the file. Hence, an additional step of Sonic agitation with an Endo-activator for approximately 3 minutes was employed in order to retrieve the separated file. The use of ultrasonics was avoided as sonic unit is more cost- effective, versatile and tips could be pre-bent more easily than ultrasonic tips.

A combination strategy led to a successful retrieval of the fractured segment with minimal damage to dentin. However, the success rate is variable and may vary from case to case, but it is worth a try.

4. Conclusion

The technique used in this case report might be considered a conservative, secure, simple, and low cost option that can be performed by any professional in the day-to-day of the endodontic clinic.

5. Conflict of Interest

The authors declare no relevant conflicts of interest.

6. Source of Funding

None.

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Author biography

Navneet Kaur, Assistant Professor

Vineeta Nikhil, Professor and HOD

Sachin Gupta, Professor

Shalini Rai, Assistant Professor

Somya Vats, Tutor

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