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Retrieval of A Separated Instrument Using Combination of Ultrasonics And Braiding Technique: A Case Report

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Abstract:
The fracture of endodontic instruments is a procedural error creating a major obstacle to root canal therapy. The separated instrument, particularly a broken file, leads to obstruction in the root canal and impedes its efficient cleaning and shaping. When an attempt to bypass the seperated instrument becomes difficult , it should be retrieved by mechanical devices. With the requirement of minimum armamentarium and patience it is possible to retrieve the separated instrument from the canal. The use of ultrasonics in endodontics have shown its reliability in the retrieval of broken instrument from the root canal. The ultrasonic tips can easily loosen the instrument fragment after which it can be retrieved using the Braiding technique.
In this case report, the successful retrieval of separated instrument and a failure case using the same technique have been shown to understand its advantages and limitations at the same time.

Introduction:
According to the American Association of Endodontics, each year, more than 15 million teeth undergo endodontic treatment[1]. During routine therapy, at any stage, an endodontic instrument can fracture due to flexural fatigue, torsion or manufacturing defects[2]. The incidence rate of intracanal fracture of endodontic hand instruments ranges between 0.25% and 6%[3]. For treating infected root canals, the removal of infected pulp tissue and obstacles is important for efficient disinfection and shaping of the canals. A separated instrument (SI) poses major challenges, including the possibility of intracanal corrosion and limited or no accessibility for chemo-mechanical preparation of the canal apical to the SI. Hence, removal of separated instrument or bypassing is necessary to gain access to the entire length of the canal[3]. The removal of SI depends upon the canal configuration, type of instrument, and its location in the canal. The presence of a gap between the SI and root canal walls eases the removal process. Removal of an SI is more predictable in maxillary teeth and anterior teeth than in mandibular teeth and posterior teeth[4]. Moreover, a fractured instrument fragment located in the coronal third of the root has a better prognosis because of improved visibility, accessibility, and conservation of radicular dentin during the retrieval procedure[3]. Hand instruments like Hedstroem files are more difficult to remove than K-files due to deeper engagement in dentin[5].
Larger rakes and helix angles and deeper flutes in the file increase the difficulty of retrieval[6]. Rotary files, because of their tendency to thread into root canal walls, are more difficult to remove than hand files[7]. While removal, the vibrations generated by ultrasonics may shorten the fragment or separate it further. Owing to the shape memory of NiTi, the separated fragment may straighten and reengage into the dentin[8].

The clinician's persistence, methodologic approach, and familiarity with ever-changing technology are essential for the successful management of SIs.

An experienced endodontist retrieves the SI without unnecessary removal of tooth structure[9]. Before finalizing any retreatment plan, the clinician must inform the patient about all viable treatment options and their associated risks and benefits. Once the patient agrees to a treatment plan, the clinician must obtain written informed consent[10]. The following case report is on the successful retrieval of a separated instrument from the junction of coronal and middle third of the canal using the combination of ultrasonics and braiding technique.

Case Report:

A 22years old female patient reported to department of conservative dentistry and endodontics, Himachal Pradesh government dental college and hospital, Shimla with a complaint of radiating pain on chewing in left lower back tooth region since 2 months. Upon clinical examination the lower left first molar had distal proximal caries and was tender on percussion. The tooth had undergone root canal treatment 1 year back. Oral hygiene status was satisfactory. Medical history was non-significant.

Periapical radiograph was performed that showed an inadequate endodontically treated tooth. A separated k-file was seen in distal canal of measurement atleast 3-4 mm at the junction of coronal and middle third of the root (Figure 1).

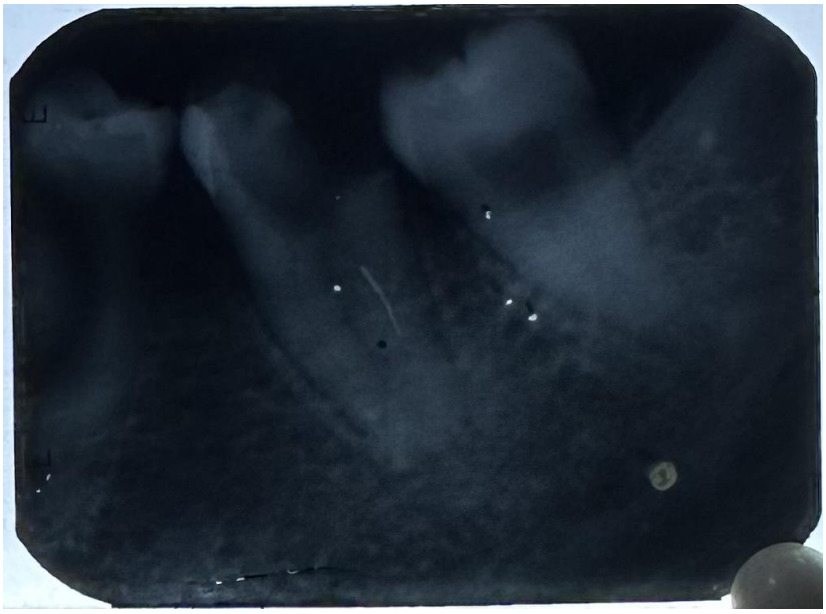


Figure 1

Clinical procedure;

The patient was notified about the condition of the tooth, and also the treatment to be done. The proposed treatment was initiated after taking the informed consent from the patient. Local anaesthesia was given via inferior alveolar nerve block and rubber dam was applied. The complete removal of caries and access opening was done with high speed rotor using the Endo access diamond coated bur (Dentsply) and the safe ended Endo Z bur (Dentsply). The root canal anatomy was found to be C- shaped in the mandibular first molar with one mesial and one distal canal present. After complete isolation, the distal canal was visualised under microscope (Labomed Magna) and head was file could be visualised under microscope

and to the naked eye as well as shown in figure 2.

Figure 2

Coronal flaring was done with GG-drills 2 and 3 followed by 4. An attempt was made to bypass the separated instrument using H-files in a sequence from 20 to 40 numbers. The canal was completely bypassed after which the endodontic ultrasonic tips were used to loosen the instrument fragment (figure 3)

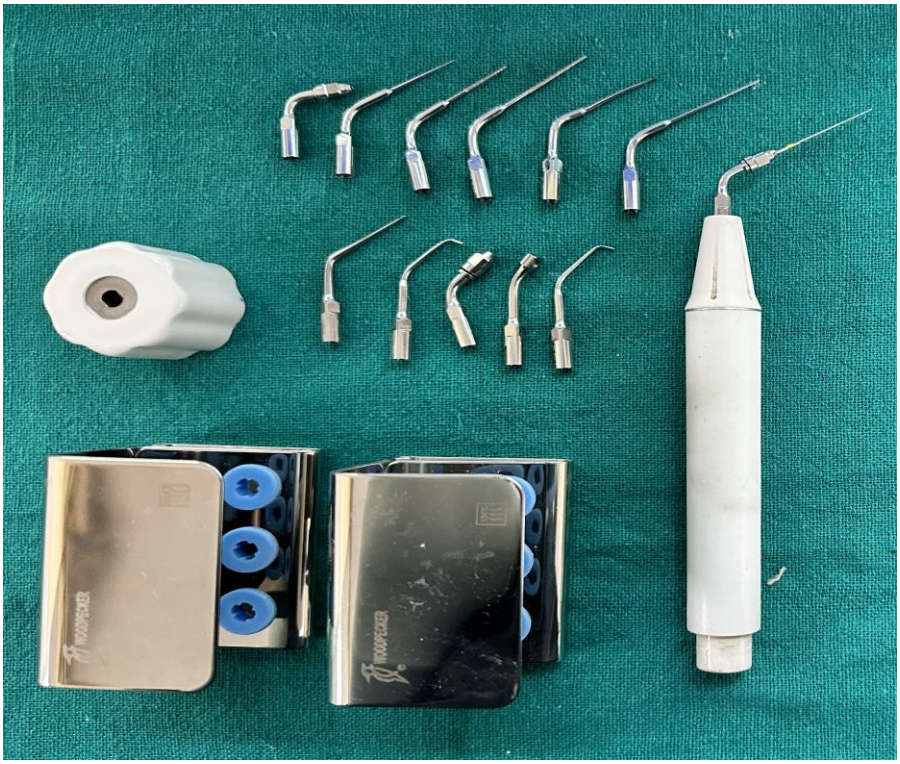


Figure 3

After the fragment was loosened, the created space was used to employ "Braiding technique" in order to retrieve the file. Two k files (no. 10 and no. 15) were inserted in the canal and twisted around the separated file and then pulled upwards towards the orifice. After several attempts, the file came out of the canal and was retrieved with the help of steigltiz forceps. The fragment was 3.5 mm in size (Figure 4)

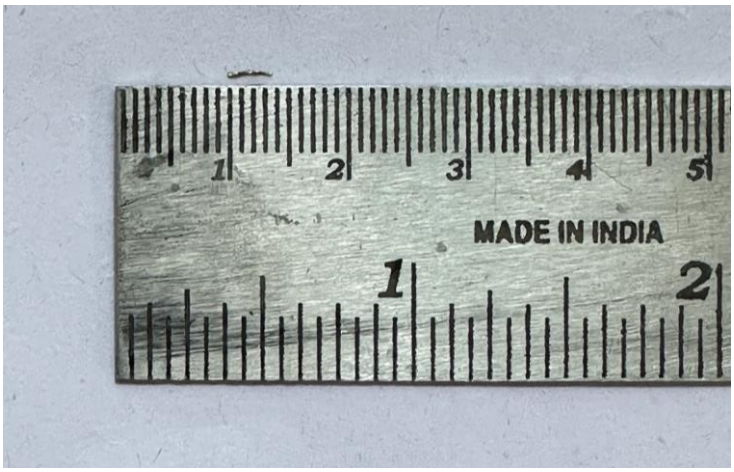


Figure 4

Confirmation of retrieval of complete fragment was done by an intra oral periapical radiograph. (Figure 5) The working length was taken using apex locator (*J.MORITA DENTAPORT ZX)* and an IOPA confirmation was done. Root canal dressing was given after completion of biomechanical preparation. The patient was recalled after a week for obturation (Figure 6). The RCT was completed in a week and the symptoms of patient were completely resolved.

Figure 5

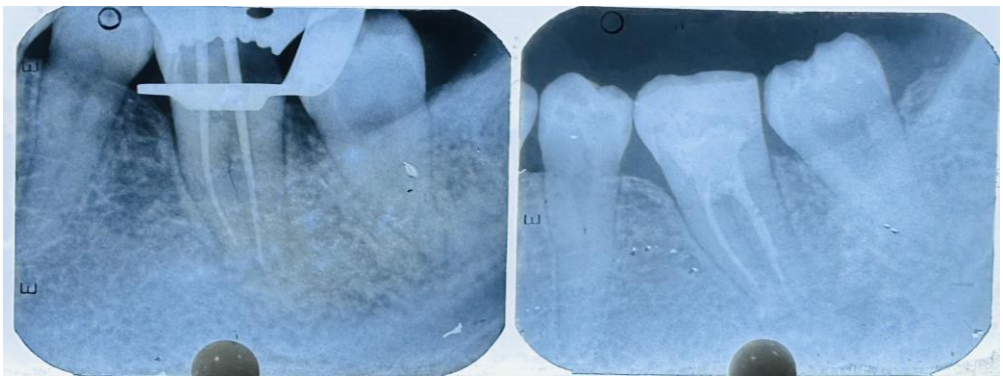


Figure 6

Discussion:

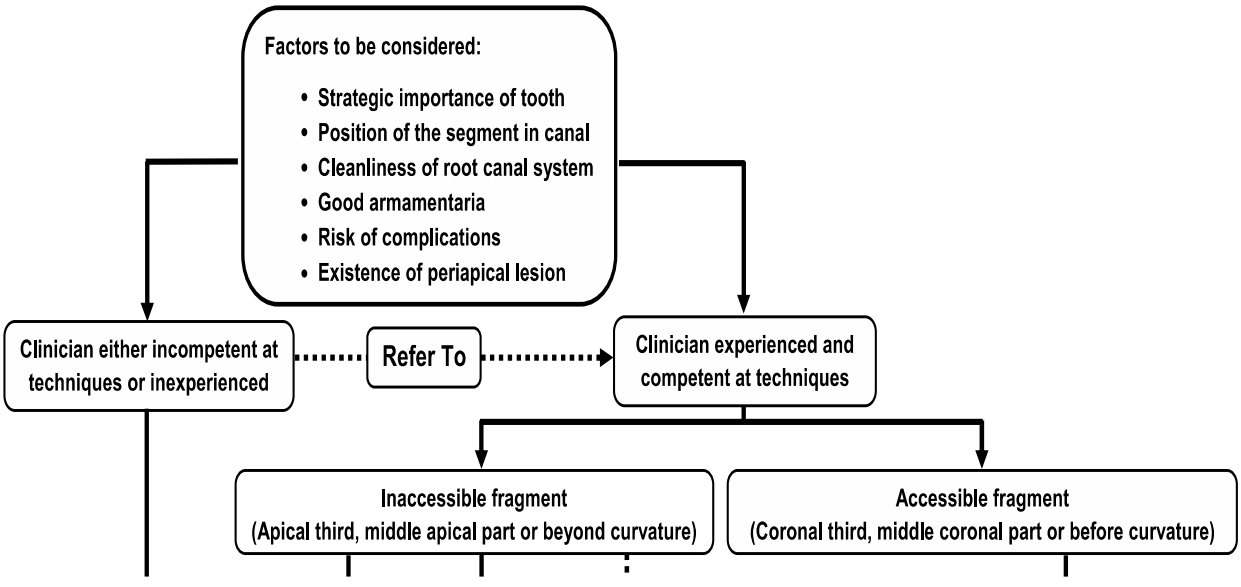
The success and an overall prognosis of root canal treatment might be adversely affected by a separated instrument within a canal.[11] Instrument separation is a common mishap that can occur even by experienced endodontists as shown in a study that incidence was (94.8%) in endodontists as compared to general dentists (85.1%).[12] The prognosis in such cases is dependent on root vitality, periapical status of a tooth, the level of separation and the status of cleaning and shaping of canal at the time of separation.[13] In order to increase the longevity of a tooth, every attempt must be made to bypass or remove the fractured instrument.

Orthograde instrument retrieval is a time taking procedure and requires a lot of effort with a 55-79% success rate.[13] Among different retrieval methods braiding technique is the simplest one, limiting excessive removal of root canal dentin and also prevents tooth from iatrogenic errors such as perforation and fracture.[14]

In this case copious irrigation with sodium hypochlorite and 15% EDTA were used for lubrication. Researches have shown that if an instrument can be bypassed it can be retrieved with ease.[15] Same as in this case after accomplishing the bypassing, braiding method was implemented. That involves insertion of 2 or 3 H- files in the canal alongside the fractured object which is then withdrawn by gripping the object through twisting of these files. The above mentioned technique resulted in a successful retrieval of the instrument with least amount of destruction to the tooth and periapical tissues.

The advancement of technology had revolutionized the field of dentistry in every aspect, resulting in the development of newer techniques for retrieval of fractured instrument. The different techniques and armamentarium includes Masserann kit, Brasseler Endo extractor kit, Cancellier instrument and Mounce extractors, Instrument removal system, Ultrasonic removal with dental operating microscope/ dental loupes, laser, electrolysis and many more.[16,17] **In comparison to the novel techniques mentioned above, the retrieval of a fractured instrument with the aid of braiding technique is a simple and low cost alternative.** It does not require any special devices, and uses routine endodontic instruments in the dental clinic, it is fast to execute and less technique sensitive.[18] In order to achieve the beneficial result an endodontist needs to charter patience, persistence and perseverance along with the least invasive method of instrument retrieval.[19]

Figure 7 shows decision making flowchart for management of intracanal fractured instruments.



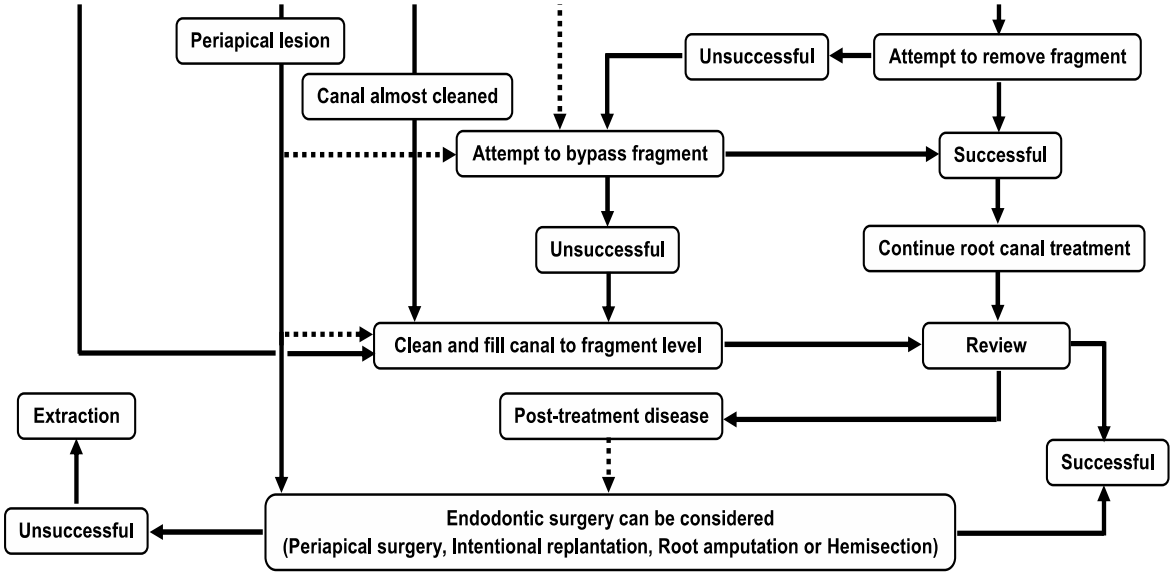


Figure 7

Conclusions:

The decision on the superiority of an instrument retrieval method is complex. So before attempting to remove the instrument, a thorough examination of the situation and consideration of the potential risks should be considered. The shape of the root canal, the state of the tooth structure's restorative work, the availability of the armamentarium, and the case's prognosis should all be taken into account. For a successful outcome, each case must be evaluated and planned individually, and care must be given throughout any retrieval attempt to minimize further canal damage.

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