ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 5, Issue – 4, August - 2022, Page No. : 257 - 262

Instrument Retrieval Systems

[1]Dr Rahimath S H, Post Graduate Student, Yenepoya Dental College, Mangalore

[2]Dr Harish K Shetty, Professor, Yenepoya Dental College, Mangalore

[3]Dr Prathap M S – Professor, Yenepoya Dental College, Mangalore

[4]Dr Sreegowri, Reader, Yenepoya Dental College, Mangalore

Corresponding Author: Dr Rahimath S H, Post Graduate Student, Yenepoya Dental College, Mangalore

Citation of this Article: Dr Rahimath S H, Dr Harish K Shetty, Dr Prathap M S, Dr Sreegowri, "Instrument Retrieval Systems", IJDSIR- August - 2022, Vol. – 5, Issue - 4, P. No. 257 – 262.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

One of the most recurrent endodontic mishaps is the separation of the endodontic instrument in the root canal. The separation impacts the final outcome of the root canal therapy. It obstructs the proper debridement and shaping procedures as well as with irrigation of the canal portion apical to the level of obstruction and also prevents three dimensional fluids tight sealing of the root canal system. When an attempt made to bypass separated instrument becomes difficult it is advised to retrieve it by mechanical devices.

Keyword: Separated Instruments, Irrigation, Retrieval

Introduction

Separation of endodontic instruments within the root canal is an unfortunate occurrence that may hinder root canal procedures and affect the outcome. Although many factors contribute to instrument separation, the exact mode of separation is not fully understood. This reflects the complexity of the separation process, the interaction of causal forces (torsional and bending), and contributing factors. The composition and design of root canal instruments have been modified, with the aim of achieving better performance and fewer undesirable complications including instrument separation. Indeed, when a new instrument or system is introduced, it is generally claimed by the manufacturer to be more efficient in preparing the root canal and more resistant to separation. The advent of nickel-titanium (NiTi) alloys has not resulted in a lower incidence of instrument separation.

Prevalence And Incidence of Instrument Fracture

Stainless steel (SS) instruments were prone to separation rate which ranges between 0.25% and 6 % and that of Nickel Titanium (NiTi) rotary instruments were reported to range between 1.3% and 10.0% (3,4,5) . (Dhakshinamoorthy Malarvizhi 2020)

Factors influencing removal of separated instruments

Tooth Factors	a. Type of tooth and root canal b. Position of the fragment within the root canal, c. Location of the fragment with regard to root canal curvature, d. Radius and degree of root canal curvature
Separated instrument factors	a. Metal alloy of instrument b. Type of separated instrument c. Length of fragment
Operator Factor	a. Skill b. Proficiency c. Judgement
Patient factors	a. extent of mouth opening b. anxiety level c. time constraints

Techniques Used for Removing the Separated Instrument

Variations in success rates have been reported according to devices, techniques, methods, and protocols used for removal of separated instruments. Before a clinician makes the decision to remove a separated fragment, he/she should ensure the availability of and successful manipulation of the required materials, instruments, and devices. Each individual case has its own unique characteristics that will dictate the approach taken to manage the case. During the past several decades many devices, techniques, and methods have been described for removal of separated instruments. Although some are still widely used, others are only of historical interest. In addition, several new promising techniques and devices have emerged. It is essential that a clinician effectively and safely handles the devices and instruments used for removing the separated fragment to avoid further complications.

All the techniques are classified here based on their principal mechanism of usage.

A. Traditional Methods

- Chemical Solvents
- Mini Forceps
- Broach And Cotton
- Hypodermic Surgical Needles
- Wire Loops
- Braiding Endodontic Files
- Softened Gutta Percha Points

B. Ultrasonic Method

C. Micro tube Removal Methods

- Lasso & Anchor
- Tube & Glue – Cancellier Extraction Kit
- Tap & Thread – Prs
- Masserann Kit
- Endo Extractor Kit – Meissinger Meitrac Endo Safety Kit
- Endo Rescue System
- Instrument Removal System
- File Removal System
- Spinal Tap Needle

D. Canal Finder System

Chemical Solvents: The use of EDTA has been suggested as a method of softening root canal wall dentin around separated instruments, facilitating the placement of files for the removal of the fragment (44). Other chemicals such as iodine trichloride, nitric acid, hydrochloric acid, sulfuric acid, crystals of iodine, iron chloride solution, nitrohydrochloric acid, and potassium iodide solutions have historically been used to achieve intentional corrosion of metal objects (39). However, for obvious reasons, such as irritating the periapical tissue, they are no longer in use.

Mini Forceps

In the presence of sufficient space within the root canal system, an instrument separated in a more coronal portion of the root canal can be grasped and removed by using forceps (45) such as Steiglitz forceps (Union Broach, York, PA), Peet silver point forceps (Silvermans, New York, NY), or Endo Forceps (Roydent, Johnson City, TN).

Broach and Cotton

If the separated fragment is a barbed broach and not tightly wedged in the root canal, another small barbed broach with a small piece of cotton roll twisted around it can be inserted inside the root canal to engage the fragment; then the whole assembly is withdrawn (45).

Wire Loops

A wire loop can be formed by passing the 2 free ends of a 0.14-mm wire through a 25-gauge injection needle from the open end until they slide out of the hub end. By using a small mosquito hemostat, the wire loop can be tightened around the upper free part of the fragment, and then the whole assembly can be withdrawn from the root canal. The loop can be either small circular or long elliptical in shape, according to canal size and the location of the fragment. This technique can be used to retrieve objects that are not tightly bound in the root canal (46).

Hypodermic Surgical Needles

The shortened tip of a hypodermic needle is rotated in a counter clockwise or clockwise direction (under light apical pressure) to cut a groove around the coronal part of the fractured fragment. As the needle advances apically, its lumen encases the coronal tip of the fragment.

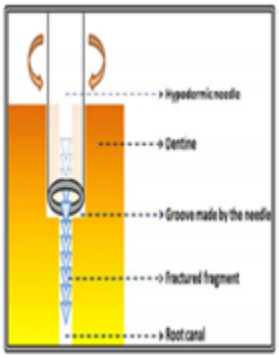

Figure 1:

Braiding of Endodontic Files

A Hedstrom or K-type file(s) can be inserted into the root canal to engage with the fragment and then withdrawn. This method can be effective when the fragment is positioned deeply in the canal and not visible and the clinician is relying on tactile sense, or the fragment is loose but cannot be retrieved by using other means(29, 35). The largest possible size of files should be used with caution because of the possibility of separation of the braided files.

Masserann Instruments

The masserann method is a technique for the removal of metallic fragments which remain lodged in the root canals. This technique is of value in number of cases which could not be treated by conventional methods. The great advantage of this method is that the fragments may be removed quickly with minimal loss of substance without heating and without risk of pushing the fragments further into the canal.(jean masserann)

Canal Finder System

The original Canal Finder System (FaSociete Endo Technique, Marseille, France) consisted of a handpiece and specially designed files (53). The system produces a vertical movement with maximum amplitude of 1–2 mm that decreases when the speed increases(39) (Fig. 2). It effectively assists in bypassing a fragment, but caution

should be exercised not to perforate the root or apically extrude the fragment, especially in curved root canals.

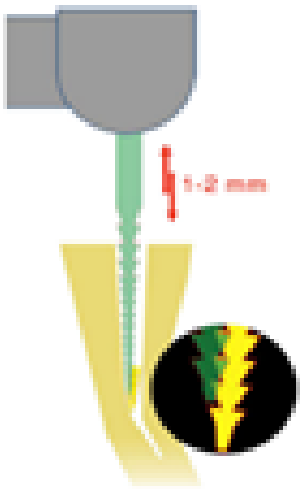

Figure 2:

Softened Gutta Percha Cones

Rahimi and Parashos reported a novel, but simple, technique to remove loose fragments located in the apical third of the root canal by using softened gutta-percha (GP) points.

Ultrasonics

Ultrasonic instruments have a contra-angled design with alloy tips of different lengths and sizes to enable use in different parts of the root canal(55). Most ultrasonic instruments have an SS core coated entirely with diamond or zirconium nitride; therefore, the instrument abrades along its sides in addition to its tip. By contrast, the titanium-based tips have a smooth surface (uncoated) and can cut only at their tip.

File Removal System

This system has been developed by Terauchi et al (42, 43), and it is claimed that the amount of dentin removed is minimal.

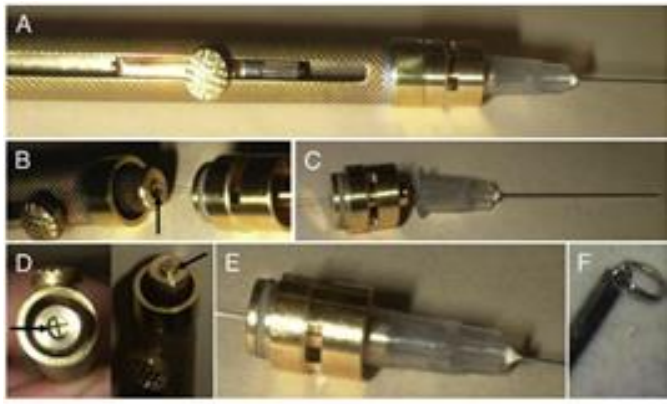

Figure 3 :The File Removal System consists of (A)a brass body (B) with a sliding handle on the side and X-shaped hole on the top (black arrows) (D). The latter embraces the double Ni-Ti wire passing through the attachment (C and E) (a head connected to a disposable tube) (C); thus the loop is formed and ready to engage the fragment (F). (Courtesy of DrYoshitsugu Terauchi.)

Lasso & Anchor

This removal method utilizes an appropriately sized microtube and a wire passed through the tube which is looped at one end and passed back through the tube. Although reported in the literature, this removal method has been essentially replaced with more practical or successful techniques[119].

Cancellier Extractor Kit (Tube & Glue)

This removal method is quite effective for retrieving a non-fluted broken instrument or when it is difficult in retrieving a separated file that is already loose.

Post Removal System (Tap & Thread)

The Post Removal System (PRS), also known as the Ruddle system. This system is used for retrieving radicular obstruction that extends coronally into the pulp chamber or in the coronal one third of large canals[112].

Endo Extractor System

The concept behind the Masserann technique has been further developed, and new extractors have been introduced. The Endo-Extractor system (Roydent) has 3 extractors of different sizes and colors (red 80, yellow 50,

and white 30) (fig. 4). Each extractor has its corresponding trephine bur that prepares a groove around the separated instrument [121].

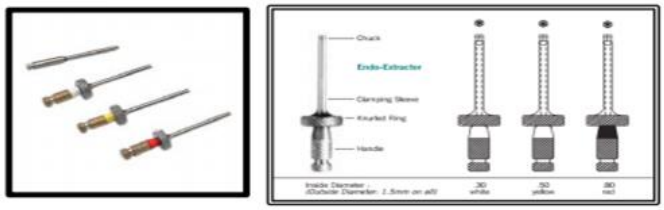

Figure 4

Endo Safety System (Meisinger Meitrac)

The recently released Meisinger Meitrac Endo safety system is able to gain a strong mechanical purchase on a broken instruments[121].

It is available as:

Meitrac I: For the removal of separated files

Size 6-15, safely and easily.

Meitrac II: For the removal of separated files

Size 15-30 and silverpoints, safely and easily

Meitrac III: For the removal of endodontic posts

Figure 5

Endo Rescue System

The Endo Rescue System consists mainly of a center drill called Pointier that excavates dentin coronal to the fragment and trephine burs that rotate in a counterclockwise direction to remove the fragment (fig. 6)[136]40.

Figure 6

Laser Irradiation

The Nd: YAG laser has been tested for removal of separated instruments[130,].34,35 It is claimed that minimum amounts of dentin are removed, reducing the risk of root fracture. In addition, fragments can be removed in a relatively short time (less than 5 minutes) in 2 ways: (1) the laser melts the dentin around the fragment and then H-files are used to bypass and then remove it, and (2) the fragment is melted by the laser.[129]

Dissolution of the Fragment via an Electrochemical Process

Ormiga et al introduced and tested a new concept that is based on electrochemical-induced dissolution of metal[131].36 Two electrodes are immersed in electrolyte; one acts as a cathode and the other as an anode. The contact between the separated file and the anode as well as an adequate electrochemical potential difference between the anode and cathode electrodes results in the release of metallic ions to the solution, consequently causing progressive dissolution of the fragment inside the root canal.

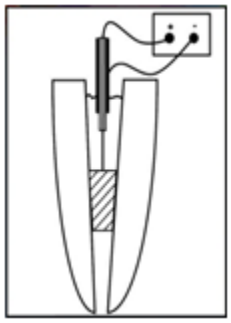

Figure 7

Conclusion

The best antidote for a broken file is prevention. Adhering to proven concepts, integrating best strategies and utilizing safe techniques during root canal preparation procedures will virtually eliminate the broken instrument procedural accident.

Prevention may also be greatly facilitated by thinking of negotiating and shaping instruments as disposable items. Simply discarding all instruments after the completion of each endodontic case will reduce instrument separation, lost clinical time and upsets.

In all situations, management options should always be thoroughly discussed with the patient, and a final treatment plan should be carefully devised that takes into consideration all mentioned factors and in the light of the patient's best interest.

References

1. Wright FD, Dailey JC. Human bite marks in forensic dentistry. Dent Clin North Am 2001; 45:365 97.

2. Sakoda S, Fujita MQ, Zhu BL, Orit ani S, Ishida K, Taniguchi M, et al. Wounding dynamics in distorted bitemarks: Two case reports. J Forensic Odontostomatol 2000; 18:46 51

3. Thali MJ, Braun M, Mark alder TH, Brueschweiler W, Zollinger U, Malik NJ, et al. Bite mark documentation and analysis: The forensic 3D/ CAD supported photo grammetry approach. Forensic Sci Int 2003; 135:115 21.