

RETRIEVAL OF SEPARATED INSTRUMENT USING A SONIC ACTIVATION DEVICE – A CASE REPORT.

Endodontics

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ABSTRACT

Procedural errors may occur during routine root canal therapy. One such unwanted and frustrating complication which might cause emotional distress to the clinician is fracture of an instrument within the canal. It has been referred to as a 'separated' or 'disarticulated' file. The separated fragment may act as hinderance in effective cleaning and shaping procedures, thereby influencing the prognosis of the tooth. Therefore, it becomes a necessary requirement to deal with the separated instrument to obtain successful results.

KEYWORDS

Instrument separation, Instrument retrieval, Endo Activator

INTRODUCTION

One of the most unfortunate events impairing the success of root canal procedure is separation of endodontic instrument within the root canal. Several factors such as canal curvatures, instrument design, manufacturing process, dynamics, instrumentation techniques and operator skill can contribute to instrument fracture.^[1]

Nickel-titanium (NiTi) files are popularly used for cleaning and shaping of root canals. Despite several advantages and favourable qualities, these files exhibit an increased rate of fracture (1.3-10.0%).^[2] A total of 57.6% dentists faced this problem of separated file during canal preparation.^[3]

Previous studies have concluded that instruments fractured in the middle third region hinder effective cleaning and shaping, necessitating removal with a relatively high rate of success and low incidence of complications.^[4]

Management of a broken instrument requires an orthograde or surgical approach. The orthograde approaches include (a) deciding to attempt removal of instrument; (b) plan to bypass instrument; and (c) prepare and obturate to the fractured segment.^[5]

Various techniques have been suggested to retrieve separated instrument such as ultrasonics, Masseran kit and instrument removal system.^[6]

Among these, the use of ultrasonic techniques combined with a dental operating microscope has reported a higher success rate. However, it may inevitably lead to removal of a certain amount of dentin and also contribute to microcrack formation, thus increasing the risk of root fracture.

Hence, in this case, a sonic device - the EndoActivator, was used with the aim of retrieval of the separated instrument.

Case Report

A 27-year-old male patient reported to the clinic with a chief complaint of pain in upper right back tooth region for two weeks. On history taking it was noted that there was no relevant past medical history but the past dental history suggested that the patient visited a private clinic 3 days ago for pain relief where the dentist performed caries excavation (disto-occlusal) and restored the site with a temporary restoration (Fig.1).

After the temporary restoration was removed, it was observed that pulpal exposure had occurred in the tooth. Radiograph revealed bayonet shaped canals wrt 14. Access cavity was prepared followed by working length determination. After the canals were negotiated upto ISO size 10 K-file (Mani Co, Tokyo, Japan), the Sx Protaper hand file was used again for a final refinement of the orifices, to achieve a more

straight-line access up to the curvature of canal. This led to fracture of apical 3mm of file, which was revealed on the radiograph as a radio-opaque material located at the junction of middle and apical third of the bayonet shaped palatal canal of 14. (Fig.2).



Fig.1 – Pre-operative Radiograph

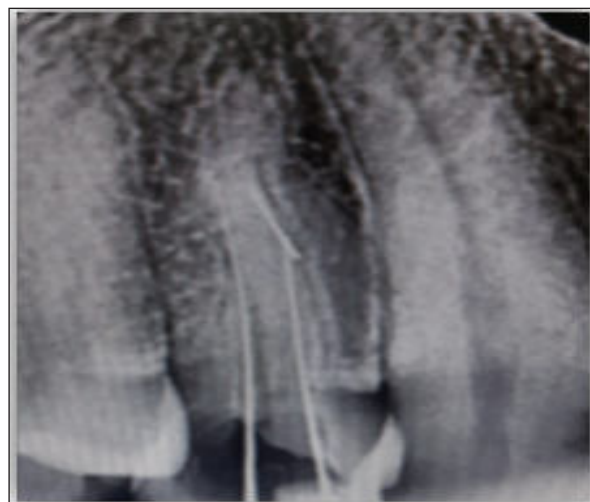


Fig.2 – Separated Sx File Located At Mid-apical Level In Bayonet Shaped Canal Of 14

Since the file fractured during an early stage of instrumentation, it was important to bypass it and aim at retrieving it. Bypassing was attempted using ISO size 06, 08 and 10 K file along with adequate use of 17% EDTA gel (Fig.3). The files were slowly advanced in the canal in a watch-winding motion until a catch was felt, after which a to and fro motion was applied. This procedure was supplemented with constant agitation of 2.5% NaOCl using a sonic device – the EndoActivator (Fig.4) (Dentsply Tulsa Dental Specialties, Tulsa, OK)



Fig.3 – Bypassing was attempted using ISO file #06, 08, 10 K file



Fig.4 – The Endo Activator

Once the separated file was retrieved (Fig.5) the apical preparation was completed upto file 25K followed by complete biomechanical preparation using ProTaper Universal (PTU; Dentsply Maillefer, Ballaigues, Switzerland) files upto size F1. Ca(OH)₂ intra-canal medicament was placed in both canals following which the patient was recalled after a week and obturation was completed using cold lateral compaction technique (Fig.6). A resin-based post-endodontic restoration was placed (Fig.7). During a one-year follow-up, the patient reported asymptomatic.



Fig.5 – File retrieved from the palatal canal



Fig.6 – Master Cone Radiograph



Fig.7 – Obturation With Post Endodontic Restoration

DISCUSSION:

A retained instrument fragment is often associated with root canal infection which might lead to a poor prognosis. Hence, the ability to clean up to the entire working length of the root canal provided by the bypassing procedure might help ensure a favourable prognosis.

Various specialized instrument-retrieval kits are available like the Masserann Kit, Cancellier Kit, IRS Kit, Canal Finder, Endo rescue, and Mini forceps that works by removal of dentin surrounding the fragment and use of microtube to grasp the fragment. Recently, Terauchi has developed a file-retrieval kit that aims to remove minimal dentin. However, these kits are not readily available, are expensive and result in considerable loss of dentin.^[7]

The aim of bypassing the fractured instrument with hand files is to disengage it from the canal by means of manual instrumentation, thus enabling retrieval of the fragment.^[8,9,10]

According to Ruddle, ultrasonic tips should only be used for removal of fractured instrument when it is visible under the DOM, to minimize possibility of excessive root damage. Unnecessary excessive and vigorous use of ultrasonic tips in more apical regions of the root canal

could result in adverse outcomes such as root perforation^[11] or weakening.^[12,13]

Although Suter et al. reported a success rate of 87% by using a variety of retrieval techniques and the DOM, when these authors used ultrasonic tips, extensive dentin removal was required to visualize the instrument fragments located apical to the curvature or not visible initially under the DOM. Also, root damage was greater than desired in some cases and led to a perforation in 7.2% of cases.

The EndoActivator System (Dentsply Tulsa Dental Specialties, Tulsa, OK) is a sonically driven irrigant activation system designed to produce vigorous intracanal fluid agitation that has been shown to increase the efficacy of irrigation better than traditional needle irrigation.^[14] It produces powerful hydrodynamic intracanal waves, the explosion of which creates bubbles which oscillate, expand and collapse as an implosion leading to radiating shockwaves that dissipate at a speed of 25,000-30,000 times per second.^[15]

In the present case report, attempts were made at bypassing the fractured instrument supplemented with agitation using a sonic device – the EndoActivator. It acts by mechanically agitating the irrigant which in turn due to cavitation and acoustic streaming mobilises the fractured instrument, provided the instrument is loose within the canal, separated in coronal or middle third of canal or lying above the canal curvature.

In such cases, the EndoActivator can be used along with bypassing in order to loosen the separated fragment. Due to its less invasive nature, it facilitates easy removal of the separated instrument without resulting in dentin sacrifice.

CONCLUSION

The procedure of retrieval of a separated instrument requires time, patience and efficiency. With the advent in technology and armamentaria, successful attempts can be made at retrieval. The EndoActivator is a sonic agitation device which can be used in cases where the fractured instrument is loose and is not too apically positioned inside the canal, without compromising the integrity of the tooth.

REFERENCES

1. Arya A, Arora A, Thapak G. Retrieval of separated instrument from the root canal using ultrasonics: Report of three cases. *Endodontology* 2019; 31:121-4.
2. Pedir SS, Mahran AH, Beshir K, Baroudi K. Evaluation of the Factors and Treatment Options of Separated Endodontic Files Among Dentists and Undergraduate Students in Riyadh Area. *J Clin Diagn Res* 2016; 10(3): ZC18-ZC23.
3. Fu, M., Huang, X., Zhang, K., & Hou, B. Effects of Ultrasonic Removal of Fractured Files from the Middle Third of Root Canals on the Resistance to Vertical Root Fracture. *J Endod* 2019; 45(11):1365-1370.
4. Plotino G, Pameijer C., Mariagrande N., & Somma F. Ultrasonics in Endodontics: A Review of the Literature. *J Endod* 2007; 33(2):81-95.
5. Al-Zahrani MS, Al-Nazhan S. Retrieval of separated instruments using a combined method with a modified vista dental tip. *Saudi Endod J* 2012; 2:41-5.
6. Natanasabapathy V, Sundar S, Koteeswaran V. Retrieval of fractured Ni-Ti rotary instrument using ultrasonics and file braiding technique under surgical operating microscope. *Endodontology* 2017; 29:65-8.
7. Sternberg RN. Retrieval of broken instrument from root canal. *Oral Surg Oral Med Oral Pathol* 1977; 44:325.
8. Ruddle CJ. Nonsurgical retreatment. *J Endod* 2004; 30:827-45.
9. Friedman S, Stabholz A, Tamse A. Endodontic retreatment: case selection and technique—part 3: retreatment techniques. *J Endod* 1990; 16:543-9.
10. Suter B, Lussi A, Sequeira P. Probability of removing fractured instruments from root canals. *Int Endod J* 2005; 38:112-23.
11. Madarati AA, Qualtrough AJE, Watts DC. A microcomputed tomography scanning study of root canal space: changes after the ultrasonic removal of fractured files. *J Endod* 2009; 35:125-8. 26.
12. Madarati AA, Qualtrough AJE, Watts DC. Vertical fracture resistance of roots after ultrasonic removal of fractured instruments. *Int Endod J* 2010; 43:424-9.
13. de Gregorio C, Estevez R, Cisneros R, et al. Effect of EDTA, sonic and ultrasonic activation on the penetration of sodium hypochlorite into simulated lateral canals: an in vitro study. *J Endod* 2009; 35:891-5.
14. Chatterjee R, Venugopal P, Jyothi KN, Jayashankar CM, Kumar SA, Kumar PS. Effect of sonic agitation, manual dynamic agitation on removal of *Enterococcus faecalis* biofilm. *Saudi Endod J* 2015; 5:125-8.