

Ultrasonics Technique to Retrieve Separated File in a Permanent Maxillary First Molar: A Case Report

Srikanth. T^{1*} Balasaraswathi. K² Dilip Chakravarthy³ Basa Srinivas Karteek⁴

¹Assistant Professor, Department of Conservative Dentistry and Endodontics, Ayder Referral Hospital, Mekelle, Ethiopia.

²Assistant Professor, Department of Conservative Dentistry and Endodontics, C.K.S Teja Institute of Dental Sciences, Tirupathi, India.

³Assistant Professor, Department of Conservative Dentistry and Endodontics, C.K.S Teja Institute of Dental Sciences, Tirupathi, India.

⁴Assistant Professor, Department of Conservative Dentistry and Endodontics, Panineeya Mahavidyalaya Institute of Dental Sciences, Hyderabad, India.

ABSTRACT

Background: In routine endodontic practice most common clinicians encounter obstructions, such as hard impenetrable pastes, separated instruments, silver points or posts in their root canals. Cleaning and shaping of a tooth with intracanal separated instrument has a potential impact on the outcome of treatment. Broken instruments usually prevent access to the apex and the prognosis of teeth with broken instruments in the canals may be lower than for normal ones. Ultrasonics have often been advocated for the removal of broken instruments because the ultrasonic tips or endosonic files may be used deep in the root canal system. Furthermore, the use of an ultrasonic endodontic device is not restricted by the position of the fragment in the root canal or the tooth involved. This case report elaborates on retrieval of broken instrument lodged at the coronal third of the canal of a permanent left maxillary first molar using ultrasonic technique.

Keywords: Separated instrument, ultrasonics.

INTRODUCTION

During endodontic therapy, dental instruments might fracture within the root canal. Furthermore, while examining the patient's radiographs for retreatment planning, the endodontist might unexpectedly encounter one or more retained endodontic instrument fragments. In clinical studies, the incidence of this complication has been reported to range from 0.39%–5%^{1,2}. It has been reported that the prevalence of separated instrument ranges from 2 to 6% by Tronstad et al and 0.5 to 5% by Iqbal et al³. Unfortunately, even with the advent of nickel-titanium (NiTi) alloy which are more resistant to fracture there has not been any significant decline in the incidence of instrument separation. Whereas separation rates of stainless steel instruments have been reported to range between 0.25 and 6%, the separation rate of

NiTi rotary instruments has been reported to range between 1.3 and 10.0%⁴. In a systematic review, Panitvisai et al⁵ assessed the prognosis of teeth after instrument fracture during endodontic therapy and found no statistically significant difference in healing rates between teeth with and without retained instrument fragments. However, the odds of treatment failure are higher when fragments prevent a thorough cleaning and shaping of the entire canal system and when periradicular lesions are present preoperatively⁵⁻⁸. When infection is present, removal or by passing of the fractured instrument is essential to ensure more predictable outcomes. Technological advancements such as the dental operating microscope (DOM) and ultrasonic have enabled enhanced visualization of the operative field and easier manipulation of the root canal, respectively^{9,10}. These technologies have made it possible for the clinician to obtain access to

Received: Nov. 11, 2017; Accepted: Dec. 30, 2017

*Correspondence Dr. Srikanth. T.

Department of Conservative Dentistry and Endodontics, Ayder Referral Hospital, Mekelle, India.

Email: gdchhyd@gmail.com

fractured instruments and can secure high success rates in the removal of instrument fragments, as reported by Cujeetal¹⁰. Ruddle¹¹ has proposed a technique for the removal of metallic instrument fragments from the root canal by using a combination of Gates-Glidden burs, microscopic magnification, and ultrasonic tips. This approach has since been adapted by Ward et al¹² and tested in clinical practice. Different techniques for retrieval of separated instruments include the use of forceps, broaches and file, chemical solvents, hypodermic surgical needles and Masserann kit, a standard procedure with definite success rate is still under investigation. Ultrasonic instruments have shown to be very effective for the removal of canal obstructions. Ultrasound vibration is transmitted to the fragment, loosening and eventually dislodging it from the canal walls. Success rates for fragment removal by using ultrasonics were reported to range from 67% by Nagai et al¹³ to 88% and 95% reported recently by Cuje et al and Fu et al respectively.

CASE REPORT

This case report describes the retrieval of separated instrument lodged at the coronal third of the canal of a permanent left maxillary first molar using ultrasonic technique. A 58-year-old female patient reported to the department of conservative dentistry and endodontics with a chief complaint of incomplete root canal treatment in upper left tooth. Patient gave history of root canal treatment at a local dentist, initiated 1 month prior. Patient was asymptomatic. Medical history was noncontributory. Clinical examination revealed incomplete access preparation and caries excavation in relation to maxillary left first molar (26). The tooth was nontender on percussion and palpation. Periodontal probing depths were normal. Tooth was nonvital. Intraoral periapical radiograph (IOPA) revealed separated instrument fragment, extending approximately 1 mm below the canal orifice at coronal third of the mesial canal without any periapical pathology. The case was diagnosed as a previously root canal treated (non vital tooth). fig.1.

In the first appointment, caries excavation and access cavity preparation was initiated and modification done. Canal orifices were located using

DG16 explorer and were enlarged using Gates Glidden drills (GG) #2, 3, 4 (Mani Inc, Japan). Obstruction to penetration was observed when #15 K file (Mani Inc, Japan) was introduced into the mesiobuccal canal. With aid of magnifying loupes ($\times 2.5$), the coronal end of fractured instrument could be appreciated in the mesiobuccal canal approximately 1 mm below the canal orifice. The presence of instrument fragment in the mesiobuccal canal was confirmed by taking IOPA radiographs from mesial and distal angulations. Under rubber dam isolation, patency of the canals was established with no #15 K file in palatal and distobuccal canals. The separated instrument was located in the buccal most area of the mesiobuccal canal. H-file was used to bypass the separated file and then Ultrasonic tip ET20, ET25 (Acteon, Satelec, France) in satelec ultrasonic hand piece at a power setting of 5, was placed into the mesiobuccal canal between the exposed end of the file and the canal wall and activated around the obstruction to remove dentin around the fractured instrument and loosen it. Following the ultrasonic activation, the instrument fragment floated out from the mesiobuccal canal. The fractured instrument was found to be a K-file, approximately 5 mm in length.

The retrieval of separated file from mesiobuccal canal was confirmed by taking an IOPA (fig. 2). Working length was established (VDW, Munich, Germany) and confirmed radiographically (fig.3). Biomechanical preparation was completed using Protaper rotary system (Dentsply India Pvt. Ltd.). Master cone determined by taking an IOPA (fig.4). The root canals were obturated by lateral condensation technique using gutta-percha (Dentsply Maillefer, China) and zinc oxide eugenol based root canal sealer. Access cavity was restored with silver amalgam (fig.5). Further on, the patient then was scheduled for restoration with fixed prosthesis.

DISCUSSION

Separated file treatment and prognosis of a tooth is based on many factors: canal preparation stage, level of microbial contamination, and intra canal location of separated file^{13,14}. Nonsurgical remedies for file fracture consist of three strategies:

To bypass the fractured file, removal of fractured instrument from canal space, and if above



Fig 1: Separated file in mesibuccal canal irt 26.



Fig 2: Instrument retrieval confirmed.



Fig 3: Working length confirmed by radiograph.

two are not possible then prepare and obturate the accessible part of the canal⁶. Presence of separated instrument in the canal hinders accessibility to the apical terminus thus compromising cleaning and shaping procedure. Hence, attempt to retrieve the separated instrument is considered as a more favorable option. However, one should keep in mind that the removal of separated instrument should not weaken the existing radicular tooth structure

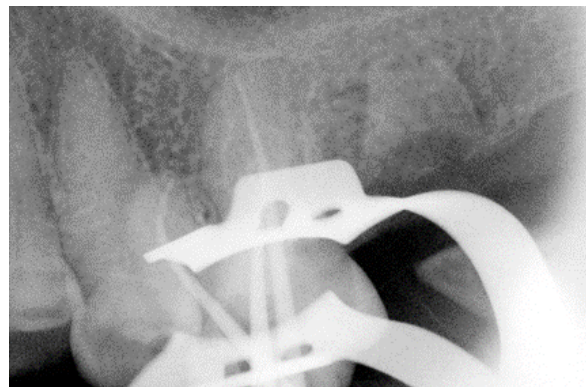


Fig 4: Mastercone radiograph.



Fig 5: Post obturation radiograph.

further as the instrument retrieval systems, such as Masserann kit involves removal of excessive radicular structure in order to gain access to the separated fragment and retrieving it would lead to root weakening, risk of perforation and postoperative fracture, thereby reducing the long-term prognostic value of the tooth. Ultrasonic technique, however, is simpler and less invasive⁹. The contra-angled design and availability of different lengths and sizes of retreatment tips enable its use in deeper parts of the canal. In this technique, GG drill with maximum cross-sectional diameter slightly larger than the separated fragment is selected. The bud of the GG drills altered by cutting it perpendicular to its long axis at its maximum cross-sectional diameter. It is used to create a small staging platform that facilitates the introduction of an ultrasonic instrument. This method was found to be highly effective in retrieval of separated instruments. Studies have shown that if it is possible to bypass the instrument then there is more chances of file retrieval. In the presented case, Since the canal was ovoid in shape, H file was used to created space between the canal wall and instrument and it was by passed upto 1/3rd of the

root canal then ultrasonic tip is placed between the exposed end of the file and canal wall and it is vibrated around the obstruction. With this trephining action and the vibration being transmitted to the separated fragment, the latter often begins to loosen and floats out of the root canal. Care should be taken so that other root canal orifices in the tooth, when present, should be blocked with cotton pellets/gutta-percha to prevent the entry of the loose fragment into the canals. However, during ultrasonics used for separated file removal precautions should be taken to prevent excessive loss of dentin, perforation, extrusion of the fragment beyond the root and temperature rise on external root surface¹⁵. The ultrasonic retreatment tip is activated at lower power settings in order to prevent tip breakage and severing of the fractured instrument. Water supply is reduced to enhance visibility into the canal. The activated file should be of a tip size that enables trephination of dentin around the fragment. If excess apical pressure with the ultrasonic instrument applied then it may lead to ultrasonic tip fracture or separated file moved apically leading to further complication. Also, to prevent separation of the ultrasonic tip, it is important to avoid unnecessary stress by only activating it when in contact with root tissue¹¹. With this after bypass of separated file followed by application of ultrasonic vibrations preserves the amount of dentin and reduces the time of retrieval.

CONCLUSION

Among various methods available for retrieval of separated instrument from root canal, ultrasonic endodontic device advocated for retrieval of fractured instruments is highly effective as its use is not restricted by position of fragment in the root canal or tooth involved.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Di Fiore PM, Genov KA, Komaroff E, Li Y, Lin L. Nickel-titanium rotary instrument fracture: a clinical practice assessment. *IntEndod J* 2006;39:700-8.
2. Parashos P, Gordon I, Messer HH. Factors influencing defects of rotary nickel-titanium endodontic instruments after clinical use. *J Endod* 2004;30:722-5.
3. Iqbal MK, Kohli MR, Kim JS. A retrospective clinical study of incidence of root canal instrument separation in an endodontics graduate program: a PennEndo database study. *J Endod* 2006;32: 1048-1052.
4. Madarati A, Hunter M. Management of intracanal separated instruments. *J Endod* 2013;39(5):569-581.
5. Panitvisai P, Parunnit P, Sathorn C, Messer HH. Impact of a retained instrument on treatment outcome: a systematic review and meta-analysis. *J Endod* 2010;36:775-80.
6. Kerekes K, Tronstad L. Long-term results of endodontic treatment performed with a standardized technique. *J Endod* 1979;5:83-90.
7. Spili P, Parashos P, Messer HH. The impact of instrument fracture on outcome of endodontic treatment. *J Endod* 2005;31:845-50.
8. Kim S. Modern endodontic practice: instruments and techniques. *Dent Clin North Am* 2004;48:1-9.
9. Plotino G, Pameijer CH, Grande NM, Somma F. Ultrasonics in endodontics: a review of the literature. *J Endod* 2007;33:81-95.
10. Cuje J, Bargholz C, Hulsmann M. The outcome of retained instrument removal in a specialist practice. *IntEndod J* 2010;43:545-54.
11. Ruddle CJ. Micro-endodontic nonsurgical retreatment. *Dent Clin North Am* 1997;41:429-54.
12. Ward JR, Parashos P, Messer HH. Evaluation of an ultrasonic technique to remove fractured rotary nickel-titanium endodontic instruments from root canals: clinical cases. *J Endod* 2003;29:764-7.
13. Shahabinejad H, Ghassemimi A. Success of ultrasonic technique in removing fractured rotary nickel-titanium endodontic instruments from root canals and its effect on the required force for root fracture. *J Endod* 2013;39(6):824-828.

14. Madrati A, Alison J. Efficiency of a newly designed ultrasonic unit and tips in reducing temperature rise on root surface during the removal of fractured files. J Endod 2009;35(6): 896-899.

15. Souter N, Messer H. Complications associated with fractured file removal using an ultrasonic technique. J Endod 2005;31(6): 450-452.

16. Fu M, Zhang Z. Removal of broken files from root canals by using ultrasonic techniques combined with dental microscope:a retrospective analysis of treatment outcome. J Endod 2011; 37(5):619-622.