10.5005/jp-journals-10031-1066

CASE REPORT

Retrieval of Separated Instrument using Ultrasonics in a Permanent Mandibular Second Molar: A Case Report

[1]Rithima Sokhi, [2] MV Sumanthini, [3]Vanitha Shenoy

ABSTRACT

Clinicians are frequently challenged by endodontically treated teeth that have obstructions, such as hard impenetrable pastes, separated instruments, silver points or posts in their root canals. Intracanal separation of endodontic instruments may hinder cleaning and shaping procedures within the root canal system, with 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. The prognosis of these cases mainly depends on the preoperative condition of the periapical tissues. For these reasons, an attempt to remove broken instruments should be undertaken in every case.

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 in the coronal third of the root canal using ultrasonics and dental operating microscope.

Keywords: Dental operating microscope, Separated instrument retrieval, Ultrasonics.

How to cite this article: Sokhi R, Sumanthini MV, Shenoy V. Retrieval of Separated Instrument using Ultrasonics in a Permanent Mandibular Second Molar: A Case Report. J Contemp Dent 2014;4(1):41-45.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Separation of endodontic instruments within the root canal is an untoward occurrence that will impede cleaning and shaping procedures and affect the long-term prognosis of the tooth. Although instrument separation is influenced by a variety of factors, the exact mode of separation is yet to be fully established.[1] It has been reported that the prevalence of separated instrument ranges from 2 to 6% by Tronstad et al[2] and 0.5 to 5% by Iqbal et al.[3] 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%.[1] Even in skilled hands, this problem can still occur and cause anxiety to both practitioners and patients.

Among possible choices of whether to maintain the file fragment or remove it from the canal space, removal of file fragment has become a favorable decision as prognostic impact subsequent to unretrieved fragment has higher failure rates. 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.[1] Ultrasonic instruments have shown to be very effective for the removal of canal obstructions.[4] 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 al[5] to 88% and 95% reported recently by Cuje et al[6] and Fu et al[7] respectively.

This case report describes the retrieval of separated instrument lodged at the junction of coronal and middle thirds of the canal of a permanent mandibular second molar using ultrasonic technique.

CASE REPORT

A 19-year-old female patient reported to the department of conservative dentistry and endodontics with a chief complaint of incomplete root canal treatment in lower left tooth. Patient gave history of root canal treatment at a local dentist, initiated 2 weeks prior. Patient was asymptomatic. Medical history was noncontributory.

Clinical examination revealed incomplete access preparation and caries excavation in relation to mandibular left second molar (37). 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 2 mm below the canal orifice, to the middle third of the mesial canal, perforation at the mesiocervical

[1]Postgraduate Student, [2]Professor, [3]Professor and Head

[1-3]Department of Conservative Dentistry and Endodontics MGM Dental College and Hospital, Navi Mumbai, Maharashtra India

Corresponding Author: Rithima Sokhi, Postgraduate Student Department of Conservative Dentistry and Endodontics, MGM Dental College and Hospital, Navi Mumbai, Maharashtra, India Phone: 9987780567, e-mail: dr.rithimasokhi@gmail.com

aspect of the tooth and periapical rarefraction in relation to the mesial root (Fig. 1). The case was diagnosed as a previously initiated root canal treatment with asymptomatic apical periodontitis in relation to 37.

MANAGEMENT

In the first appointment, caries excavation and access cavity preparation was initiated. During access cavity, modification presence of perforation in the cervical area on the mesial aspect was detected (Fig. 1). Gingival retraction was done using retraction cord (Knit Trax 000, USA) for adequate exposure of subgingival extent of the perforation site. Perforation was repaired using resin modified glass ionomer cement (RMGIC) (GC India Dental Pvt Ltd, India). Canal orifices were located using DG16 explorer and were enlarged using Gates Glidden drills (GG) #2, 3, 4 (Mani Inc, Japan). The mesial canals were explored using #10 K file (Mani Inc, Japan) and no interferences in negotiating the canal was encountered. Obstruction to penetration was observed when #15 K file (Mani Inc, Japan) was introduced into the mesiobuccal canal. With aid of magnifying loupes (×2.5), the coronal end of fractured instrument could be appreciated in the mesiobuccal canal approximately 2 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. An intracanal dressing of a thick paste of calcium hydroxide (Deepashree products, India) and saline was placed in the canals and temporized with cavit (3M ESPE, Germany).

Patient was recalled after 2 weeks. Under rubber dam isolation, access cavity was re-entered and calcium hydroxide dressing was removed by copious irrigation with 5% sodium hypochlorite (Trifarma, India). Patency of the canals was established with no #15 K file. Mesiolingual and distal canals were blocked with gutta-percha cones (Fig. 2). Exact location of separated instrument within the canal was confirmed under the Dental operating microscope (Carl Zeiss, Germany) (Fig. 3). The separated instrument was located in the lingual most area of the mesiobuccal canal. Ultrasonic tip ET25 (Acteon, Satelec, France) (Fig. 4A) in satelec ultrasonic hand piece (Fig. 4B) at a power setting of 3, was placed into the mesiobuccal canal between the exposed end of the file and the canal wall and activated around the obstruction in a counter clockwise direction 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 Hedstrom file, approximately 4 mm in length (Fig. 5).

The patency of the mesiobuccal canal was confirmed under the dental operating microscope (Fig. 6). An IOPA was taken to confirm the same (Fig. 7). Working length was established using Electronic apex locater, Raypex 5 (VDW, Munich, Germany) and confirmed radiographically (Fig. 8). Biomechanical preparation was completed using Profile rotary system (Dentsply India Pvt. Ltd.). The root canals were obturated by lateral condensation technique using gutta-percha (Dentsply Maillefer, China)and AH Plus root canal sealer (Dentsply, Germany). Lateral condensation was followed by vertical compaction using continuous wave compaction technique with E and Q Master system (Meta Biomed, Korea). Access cavity was restored with silver amalgam (Fig. 9). Further on, the patient then was scheduled for restoration with fixed prosthesis.

DISCUSSION

Treatment option and long-term prognosis of treatment subsequent to file fracture is influenced by many factors: canal preparation stage, level of microbial contamination

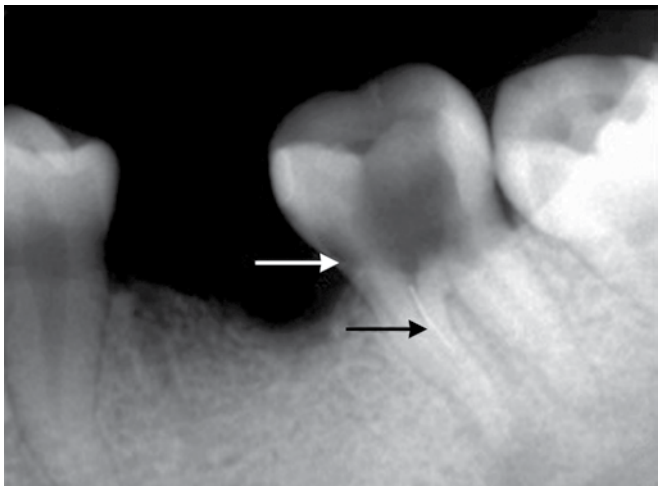

Fig. 1: Preoperative radiograph showing separated instrument in the mesiobuccal canal (black arrow); perforation (white arrow) in the cervical area of the mesial surface of 37

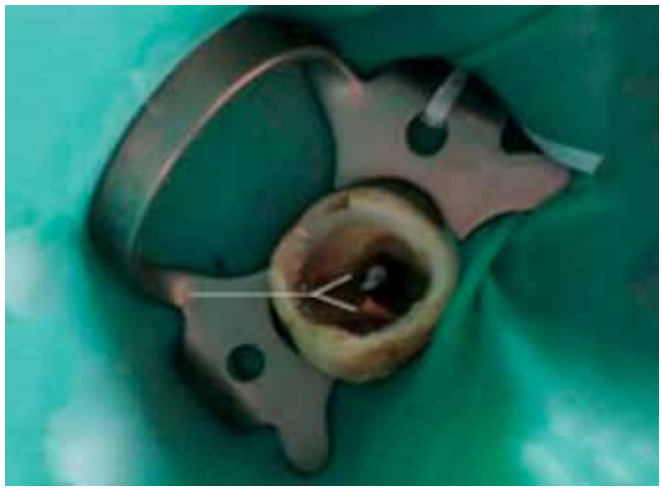

Fig. 2: Mesiolingual and distal canals blocked with gutta-percha cones (white arrow)

and intracanal location of separated file.[8,9] Nonsurgical remedies for file fracture consist of three strategies: removal of fractured instrument from canal space, to bypass the fractured file and instrument in the apical third and if above two are not possible then prepare and obturate the accessible part of the canal.[2]

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 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,[1] thereby reducing the long-term prognostic value of the tooth. Ultrasonic technique, however, is simpler and less invasive.[10] The contra-angled design and availability of different lengths and sizes of retreatment tips enable its use in deeper parts of the canal.

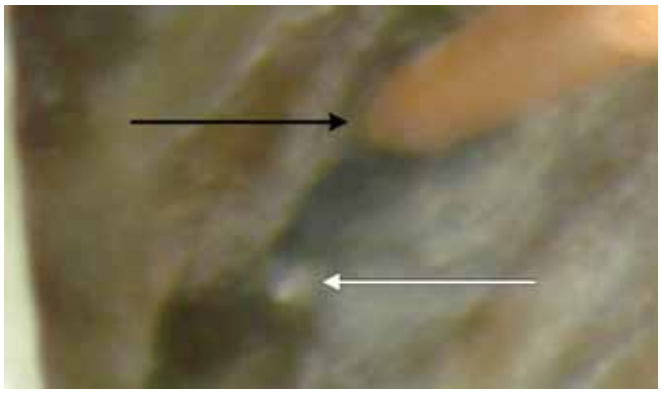

Fig. 3: Broken instrument viewed under dental operating microscope (black arrow indicates gutta-percha point inserted to block the mesiolingual canal; white arrow indicates separated instrument lodged in the mesiobuccal canal)

Fig. 4A: ET25 ultrasonic tip

Fig. 4B: Satelec ultrasonic handpiece at power setting 3

Ruddle et al reported a technique that comprised of modified Gates-Glidden burs, ultrasonic devices, and a dental operating microscope.[11] In this technique, GG drill with maximum cross-sectional diameter slightly larger than the separated fragment is selected. The bud of the GG drill is 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.

In the presented case, the fractured fragment was lodged closer to the middle-third of the canal, gaining a proper grip with the help of Stieglitz forceps could not be achieved (Fig. 1). Also, since the radicular dentin close to furcation area was considerably thinned out, the canal orifice could not be enlarged further to accommodate the trepans of Masserann kit. Since the canal was ovoid in shape, the use of ultrasonics was considered to create a purchase around the file and loosen it within the canal to facilitate retrieval with minimal removal of tooth structure. In cases where instrument fragment resists removal, a file can be introduced along the length of the separated instrument and ultrasonic vibration is applied to the file in an attempt to remove it. This technique is termed as indirect ultrasonics.[12] However, caution should be exercised as complications of ultrasonic

Fig. 5: Separated instrument retrieved

removal include excessive loss of dentin, perforation, extrusion of the fragment beyond the root and temperature rise on external root surface.[13]

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 reduce to enhance visibility into the canal. The activated file should be of a tip size that enables trephination of dentin around the fragment.

Fig. 6: Patent mesiobuccal canal after retrieval of separated instrument viewed under dental operating microscope

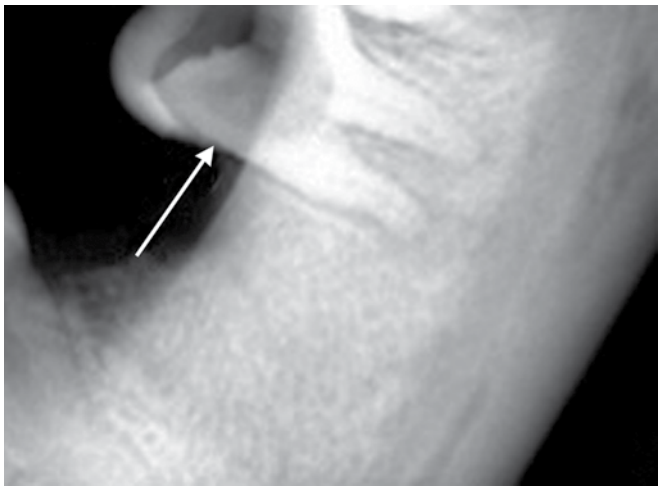

Fig. 7: Perforation repair (white arrow) with RMGIC patent mesiobuccal canal after retrieval of separated instrument

However, files that are too small should not be used because they are themselves prone to separation.

The ultrasonic tip is placed between the exposed end of the file and canal wall and it is vibrated around the obstruction in a counterclockwise direction that applies an unscrewing force to the file as it is being vibrated. This technique will help in removing instruments that have a clockwise cutting action. If the file has a counterclockwise cutting action, then a clockwise rotation will be needed. 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 (see Fig. 5). Furthermore, if one is not cautious and excessive pressure is applied, the vibrations may push the fragment further apically, or cause the ultrasonic tip to fracture leading to a more complicated scenario. Also, to prevent separation of the ultrasonic tip, it is important to avoid unnecessary stress by only activating it when in contact with root tissue.[11]

The separated instrument was a Hedstrom file. H-type files are made by cutting the spiralling flutes into the shaft of a piece of round, tapered, stainless steel wire. Reaming motion locks the flutes into the dentin and to continue doing so would fracture the instrument. Moreover, the file is impossible to withdraw once it is locked in the dentin and can be withdrawn only by backing off until the flutes are free. This action also separates the files. Zinelis and Margelos[14] stated that fatigue is the primary cause of failure of Hedstrom file whereas Kosti et al[15] stated that the instrumentation technique that is used also can contribute to failure.[16]

CONCLUSION

There exist no standardized procedure for successful and guaranteed removal of separated instrument from

Fig. 8: Working length radiograph

Fig. 9: Post-obturation radiograph

the canal. Among the various techniques available, the 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. Finally, improved visualization combined with a conservative approach, balanced with favorable prognosis is the treatment option of choice.

REFERENCES

1. Madarati A, Hunter M. Management of intracanal separated instruments. J Endod 2013;39(5):569-581.
2. Kerekes K, Tronstad L. Long-term results of endodontic treatment performed with a standardized technique. J Endodon 1979;5: 83-90.
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. Hargreaves K, Cohen S. Cohen's pathways of the pulp. 10th ed. Missouri, Elsevier Mosby, 2011:929-930.
5. Nagai O, Tani N, Kayaba Y, et al. Ultrasonic removal of broken instruments in root canals. Int Endod J 1986;19:298-304.
6. Cuje J, Bargholz C, Hulsmann M. The outcome of retained instrument removal in a specialist practice. Int Endod J 2010; 43:545-554.
7. Fu M, Zhang Z, Hou B. Removal of broken files from root canals by using ultrasonic techniques combined with dental microscope: a retrospective analysis of treatment outcome. J Endod 2011; 37:619-622.
8. Shahabinejad H, Ghassemmi 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.
9. 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.
10. Plotino G, Pameijer C. Ultrasonics in endodontics: a review of the literature. J Endod 2007;33(2):81-95.
11. 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.
12. Stephane S, Wilhem J. Clinical success in endodontic retreatment. First ed. Quintessence Publishing Co.in. 2009;64.
13. Souter N, Messer H. Complications associated with fractured file removal using an ultrasonic technique. J Endod 2005;31(6): 450-452.
14. Zinelis S, Margelos J. Failure mechanism of Hedstrom endodontic files in vivo. J Endod 2002;28:471-473.
15. Kosti E, Zinelis S, Lambrianidis T, Margelos J. A comparative study of crack development in stainless-steel Hedstrom files used with step back or crown-down techniques. J Endod 2004; 30:38-41.
16. Ingle JI, Bakland LK. Ingles Endodontics. 6th ed. BC Becker Inc. 2008;821.