

Separated Instrument Removal from Root Canal System of Upper Central Incisor: A Case Report

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Abstract

Instrument fracture within the root canal during root canal treatment is an unwanted and frustrating complication. Fractured portion of instruments may interfere the root canal treatment prognosis due to improper cleaning and shaping. Endodontic instrument fracture occurs due to overuse or incorrect use of instrument. After separation of an endodontic reamer or file during procedure, incident should be informed to patient and should discuss with the patient whether to remove the fragment or bypass it or leave it as it is. If a separated instrument is managed properly, incident may not effect the prognosis of the treatment. In this case report a 25 year old female patient attended to Department of Conservative Dentistry and Endodontics BSMMU, with complaints of mild pain, dislodgement of restoration and history of root canal treatment one month back on her both maxillary central incisors. This case was clinically and radiologically evaluated. On clinical examination there was fracture of both maxillary central incisor with open root canal system without any interim restoration. Both of the tooth was mild painful on palpation, tender on percussion and there was no mobility. An intra oral periapical radiograph showed that there is a separated instrument present in the root canal system of left sided maxillary central incisor. The separated instrument was removed from the canal and root canal treatment was done to both of the tooth. After completion of the treatment patient was symptoms free an advised for periodic recall.

Keywords: Instrument Separation; Procedural Error; Failure of Root Canal Treatment

Introduction

In our daily clinical practice during an endodontics procedure, most of the clinician may have the experience of different endodontic mishaps, such as perforation, ledging and intra canal instrument separation. While biomechanical preparation, potential risk of instrument separation is present. After breakage of an instrument, it may results in despair, anxiety though the possibilities of techniques nonsurgical retreatment is still exist to remove the instrument from the canal system [1].

Grossman stated in a study in 1969 that the stainless steel instruments have a limited torque resistance capacity, if exceeds fail and torsional stress and cyclic loading may result in failure and separation of NiTi rotary files. A separated instrument usually not the only cause of failure of a root canal treatment. Most of the times

an intra canal broken instrument causes in difficulty in the biomechanical preparation of root canal system [2].

Presence of an intra canal separated instrument may effect the treatment outcome and prognosis a root canal treatment. Fox., *et al.* in a clinical study mentioned that failure of root canal treatment is influenced by the presence of an intracanal separated instruments [3]. In 1991 Elezer stated in a study that if an intra canal broken endodontic instrument is left alone within the canal, this may results in liberation of some corrosion substance within the canal and as a result root canal treatment may fail [4].

If an intra canal instrument separation occurs, proper clinical and radiological evaluation is needed and after proper evaluation the separated instrument may be retrieved or bypassed and obturation of the root canal space can be done or true blockage can

occur [5]. In majority of the separation cases, retrieval of the fractured instrument is the best treatment option. Very often in clinical practice orthograde retrieval of separated fragment is difficult and time consuming procedures [6]. Surgical removal often indicated when all non invasive technique are failed [6].

The retrieval of a separated intra canal instrument which is located in the apical one third of the root canal system is extremely difficult, complex and while doing so, can lead the risks of root perforation, ledge formation, and root fracture [5,7]. Gerek, *et al.* in 2012 concluded in a study that the type of canal and presence of acute curvature in the canals, instrument type and the risk of the damage to the remaining tooth structure should be considered when making a treatment plan for retrieving fractured fragments from that location [5].

For the management of a separated intra canal instrument, particularly retrieving, different types of instruments and techniques have been described by different authors which includes conventional method, drills, extractors, ultrasonic tips, dental operating microscopes, and electrochemical processes [8,9], but for the removal of a intra canal instrument till now any particular standardised technique is established for. In this case report conventional method was used to remove the separated instrument. Conventional extractors like the Masserann kit [Micro-Mega, Besancon, France], and new extractor systems, like the Endo Rescue kit [Komet/Brasseler, Savannah, GA, USA] are popular and effective for the retrieval of instrument fragments after intracanal separation⁸. Usually, those extractors system are very effective in the anterior teeth with thick, straight roots or in the straight canal portions of posterior teeth [9,10].

Alternative techniques include the use of injection or hypodermic needles [11], the Canal Finder system [12], needle holders [1], stainless-steel tubes and Hedström files [14], modified spreaders or K-files under ultrasonic vibration, file-removal systems [15], chloroform-dipped gutta-percha cones [16] and microtubes with internal screw wedges [17].

Case Report

A 25 year old female patient named Chaya Rani Sharker reported in the Department of Conservative Dentistry and Endodontics BSMMU with chief complaint of mild pain and dislodgement of restoration in relation to upper front teeth. Patient gave history of root canal treatment in those teeth at a clinic, 1 month back. Patient was experiencing mild pain particularly during biting in the same teeth since the treatment was completed. On extra oral exam-

ination there was no abnormality detected. Intra oral examination revealed fracture of both maxillary central incisor with open root canal system without any interim restoration. Both of the tooth was mild painful on palpation, tender on percussion and there was no mobility. An intra oral periapical radiograph showed that there is a separated instrument present in the root canal system of left sided maxillary central incisor.

Diagnosis

Chronic periapical periodontitis of maxillary central incisors with broken instrument in left maxillary central incisor.

Treatment plan

Removal of the broken instrument from the left maxillary central incisor and endodontic treatment of both maxillary central incisors.

Treatment procedure

The total procedure was explained to the patient and written consent was taken. Initial mouth preparation was done by doing scaling and polishing. Teeth were isolated with cotton role. Debridement of the root canal system was done with copious irrigation of normal saline. Then access cavity was modified to facilitate proper visualization for both teeth. Magnifying mirror and magnifying glass was used to determine the location of the broken instrument. Dentine around the separated fragment was removed with the help of no 1 Gates-Glidden drills. Care was taken that the tip of the drill does not interfere the broken instrument that might push it farther apically. Copious irrigation was done with 2.5% NaOCl was done. Then no 15 k file was introduced to create space in distal side of the fragment. 17% EDTA was placed into the canal for 2 minutes to facilitate disengagement as a chelating agent. Gradually the number of instrument was increased upto 30. Same procedure was carried out on the opposite side also. Status of the fragment was checked time to time whether it is disengaged or not with endodontic explorer. Once it was disengaged two separate instrument was inserted (H File no -30) into the canal and were engage to create a mechanical lock with the loosen fragment and pulled to remove. On third attempt the separated fragment came out of the canal.

After removal of the separated part canal was flashed with normal saline and NaOCl (5.25%). Then working length measuring radio graph was taken. Established working length of the teeth are 23 mm for the left maxillary central incisor and 19.5 mm for the right maxillary central incisor from the highest point of the inci-

sal edge. Standardized technique was followed to prepare the root canal system. Root canal preparation was done up to no 80 k file. Root canal treatment was completed in two visits. Calcium hydroxide paste was placed as an intra-canal medicament for one week. Standard protocol of irrigation for two visit non-vital tooth was followed for irrigation of the root canal system. Root canals were obturated with calcium hydroxide containing sealer (Sealapex) and GP point. Permanent restoration was done with glass ionomer restorative material. Patient was instructed to come for periodic follow-up.

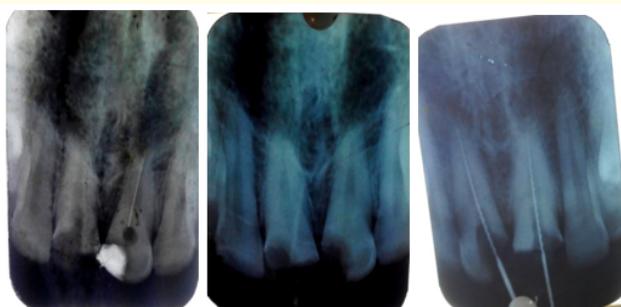


Figure 1: Initial Radiograph after removal of instrument w/l m X-ray.



Figure 2: Post operative X-Ray after 3 month.

Discussion

Endodontic mishaps can occur while root canal treatment and the contributory factor may or may not under the operators control. Instruments made of stainless steel may fail by excessive rotational torque and NiTi instruments can be separated due to combination of torsional stress and cyclic loading. The contributory factor of instrument separation may include faulty instrumen-

tation technique, use of torque controlled motor; core dimension and surface conditioning of the instrument, rotation rate, radius of canal curvature, presence of straight line access and glide path to apical portion of the canal. Root canal instruments are indispensable for root canal space preparation [1].

An instrument fracture may result if its over strength or when if cracked, extended to such a way that the rest of cross section of the instrument is not able to bear the rotational load. Small number of endodontic instruments like no 10 15, 20 are highly susceptible to distortion and fracture due to the excessive stress on their small cross sections. Nickel-titanium (NiTi) instrument fracture rates range from 1.9% to 2.4% [18]; fracture occurs more commonly in molars than in premolars, followed by anterior teeth. ProTaper rotary instruments frequently fracture in the apical thirds of root canals, and fragments of finishing files are usually longer than those of shaping files [18]. Fractured fragment itself may not cause treatment failure but its being stock within the root canal can prevent improper preparation and disinfection resulting in a negative effect on the treatment outcome [19].

Retrieval attempt of a separated instruments may result in formation of ledge, over instrument, over enlargement and transportation of prepared root canal or can lead to perforation. So, while doing so a clinician need to evaluate the treatment options such as attempting to remove the instrument, bypassing it or leave the fractured fragment in the canal. The definitive treatment plan is to be should be made with the consideration for pulp status, canal infection, canal anatomy, position of the fragment and the type of fractured instrument [20,21]. In this case report fractured portion was decided to remove because of it was favorable to remove considering above points.

Now a days most commonly used devices for the removal of a fractured instruments are: ultrasonic devices, extraction tubes (Masserann kit), Canal Finder system and manual instruments. The main factor that determines the removal of the separated instrument fragment is the location of the fragment in relation to the curvature of the root canal. If the fragment is situated coronal to the curve, retrieval of the separated part is possible; but if the fractures part remains beyond the curvature, then the retrieval of that fragment is quite difficult. Retrieval of separated instrument fragment from the root canal need some extent of good clinical skills, equipment support, advanced instruments and good knowledge of root canal anatomy. In this case report the separated instrument fragment was accessible in the coronal one third and as the canal was straight, it was an ideal case to be selected for removal.

In a clinical study Ward, *et al.* concluded that the ultrasonic technique is effective and proved successful at removing fractured rotary nickel titanium instrument from narrow and curved root canals in clinical cases [19]. Yoldas, *et al.* showed that using Masseran kit drills to retrieve instrument may increase the risk of perforations in curved canals [20]. Friedman, *et al.* in their clinical study concluded that Masseran kit is not good as ultrasonics tips [21].

Previous clinical studies suggested that the removal of fractured instruments fragment successfully depends on different factors such as the type of fractured instrument, the canal anatomy, the degree of canal curvature and on the specific technique used [19]. Ward, *et al.* said that i NiTi rotary instruments is more difficult to remove from the canal than hand instruments. It is because NiTi instrument generally separate at a smaller length, further apically impacted at or around the curve of narrow canal walls [19].

Ya Shen, *et al.* considered that the type of tooth, type of tooth root greatly influence the removal of the separated instrument [22]. Dimension of root canal and irregularities of root canal has significant effect on the success of removal procedure were reported by Hulsmann and Schinkel [23]. In this very case report maxillary central incisor tooth was involve that make it easier to remove. Lower success rate in removing instrument from apical third of the root canal was reported by Souter, *et al* [24]. Despite of using endodontic microscope to improve visualization deeper into the canal it was difficult to retrieve a separated instrument in apical areas in curved canals [25-27].

Conclusion

Prevention is the best antidote for a separated file in the canal. Proper clinical knowledge adopting with proven concepts and making use of safe techniques during root canal preparation procedures will significantly reduce the separated instrument procedural accident during root canal treatment. Fracture of instrument may be prevented if the instruments used for negotiating and cleaning and shaping the root canal are relatively new and disposed to avoid re use. However, during root canal preparation an instrument may be separated and despite of using the best existing technologies and techniques having good clinical knowledge and skill, the removal attempt may not be successful. Good anatomical knowledge, proper clinical evaluation, clinical experience and adequate technological support play important role in successful removal of a separated instrument from root canal system.

Bibliography

1. Rahimi M, Parashos P. A novel technique for the removal of fractured instruments in the apical third of curved root canals. *Int Endod J.* 2009;42(3):264-270.
2. Grossman LI. Guidelines for the prevention of fracture of root canal instruments. *Oral Surg Oral Med Oral Pathol.* 1969;28(5):746-752.
3. Fox J, Moodnik RM, Greenfield E, Atkinson JS. Filing root canals with files radiographic evaluation of 304 cases. *N Y State Dent J.* 1972;38(3):154-157.
4. Eleazer PD. Lack of corrosion of stainless steel instruments in vivo by scanning electron microscope and microprobe analysis. *J Endod.* 1991;17(7):346-349.
5. Parashos P, Messer HH. Rotary NiTi instrument fracture and its consequences. *J Endod.* 2006;32(11):1031-1043.
6. Nevares G, Cunha RS, Zuolo ML, Bueno CE. Success rates for removing or bypassing fractured instruments: a prospective clinical study. *J Endod.* 2012;38(4):442-444.
7. Madarati AA, Qualtrough AJ, Watts DC. Vertical fracture resistance of roots after ultrasonic removal of fractured instruments. *Int Endod J.* 2010;43(5):424-429.
8. Gerek M, Başer ED, Kayahan MB, Sunay H, Kaptan RF, Bayırlı G. Comparison of the force required to fracture roots vertically after ultrasonic and Masseran removal of broken instruments. *Int Endod J.* 2012;45(5):429-434.
9. Masseran J. "Entfernen metallischer Fragmentea us Wurzelkanalen" (Removal of metallic fragments from the root canal). *J Br Endod Soc.* 1971;5(3):55-59.
10. Madarati AA, Hunter MJ, Dummer PM. Management of intracanal separated instruments. *J Endod.* 2013;39(5):569-581.
11. Okiji T. Modified usage of the Masseran kit for removing intracanal broken instruments. *J Endod.* 2003;29(7):466-467.
12. Roig-Greene JL. The retrieval of foreign objects from root canals: a simple aid. *J Endod.* 1983;9(9):394-397.
13. Hülsmann M. Removal of silver cones and fractured instruments using the Canal Finder System. *J Endod.* 1990;16(12):596-600.
14. Kleier DJ, Mendoza M. The use of tungsten carbide needle holders to remove intracanal objects. *J Endod.* 1996;22(12):703-705.

15. Suter B. A new method for retrieving silver points and separated instruments from root canals. *J Endod.* 1998;24(6):446-448.
16. Nehme W. A new approach for the retrieval of broken instruments. *J Endod.* 1999;25(9):633-635.
17. Terauchi Y, O'Leary L, Suda H. Removal of separated files from root canals with a new file-removal system: case reports. *J Endod.* 2006;32(8):789-797.
18. Ruddle CJ. Nonsurgical retreatment. *J Endod.* 2004;30(12):827-845.
19. 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(11):764-767.
20. Yoldas O, Oztunc H, Tinaz C, Alparslan N. Perforation risks associated with the use of Masserann endodontic kit drills in mandibular molars. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2004;97(4):513-517.
21. Friedman S, Stabholtz A, Tamse A. Endodontic retreatment: case selection and technique. Part 3. Retreatment techniques. *J Endod.* 1990;16(11):543-549.
22. Ya ShenPeng B, Cheung GS. Factors associated with the removal of fractured instruments from root canal systems. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2004;98(5):605-610.
23. Hulsmann M, Schinkel I. Influence of several factors on the success or failure of removal of fractured instruments from the root canal. *Endod Dent Traumatol.* 1999;15(6):252-225.
24. Souter NJ, Messer HH. Complications associated with fractured file removal using an ultrasonic technique. *J Endod.* 2005;31(6):450-452.
25. Khayat BG. The use of magnification in endodontic therapy: the operating microscope. *Pract Periodontics Aesthet Dent.* 1998;10(1):137-144.
26. Masserann J. Removal of metallic fragments from the root canal. *J Br Endod Soc.* 1971;5(3):55-59.
27. Ruddle CJ. Nonsurgical retreatment. In: Cohen S, Burns RC, editors. *Pathways of the pulp.* 8th edition. St Louis: CV Mosby Co; 2002:875-929.

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