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Retrieving a Separated Instrument from the Root Canal: A Case Report

Dr. Anshu Singh[1], Dr. Sushma[2]

[1,2]Department of Conservative Dentistry and Endodontics, PGIDS, Rohtak

ABSTRACT

Separation of an endodontic instrument is a common procedural mishap. A separated instrument hinders complete cleaning and shaping of the canal, thereby influencing the outcome of endodontic treatment.While various instrument retrieval kits and devices are available, ultrasonics are generally considered the most conservative and preferred method. This case study describes the successful retrieval of a separated instrument using ultrasonic techniques and magnification

INTRODUCTION

Instrument separation during root canal treatment is a common procedural mishap, with studies indicating that it happens in 2% to 6% of cases(1). Effective root canal treatment requires the complete removal of infected material and any obstructions within the canal. Separation of an instrument within the canal significantly complicates the procedure. The separated instrument can corrode within the canal and impair accessibility, hindering proper cleaning and shaping. Therefore, it is imperative to remove the separated instrument or bypass it(2).

Retrieval of separated instruments depends on several factors such as instrument length, curvature, size of the fractured instrument, and root canal curvature(3). Retrieval is more predictable in maxillary and anterior teeth than mandibular and posterior teeth(3).Techniques for retrieving broken instruments from the root canal are generally be categorized into three main approaches: mechanical, chemical, and surgical methods(3).

The most preferred method is mechanical as the surgical method is invasive and is considered the last resort for instruments fractured in the middle and apical third of the root, whereas the chemical method is unpredictable and takes a longer time(3).Various methods have been suggested for retrieval of separated instruments using mechanical devices (Masserann Kit (Micro-mega), Micro-Retrieve & Repair System (Superline NIC Dental), Cancellier Extractor Kit (SybronEndo),iRS (Dentsply Tulsa Dental) Endo Extractor (Brasseler Inc.), and Endo Rescue (Komet/Brasseler)and involving use of ultrasonics and special files. Research has indicated that use of ultrasonics in conjunction with magnification has resulted in a high success rate for recovering the separated instrument(4–6). This case study presents the removal of the separated instrument in the middle third of the root canal using ultrasonics and magnification.

CASE REPORT

A 32-year-old female reported dull, continuous pain in the mandibular left back teeth region for 2 weeks. The patient gave a history of endodontic treatment one month back, but the pain was not alleviated. On clinical examination, the left mandibular second premolar with open access cavity and dislodged restoration was seen. The tooth was tender on percussion. The tooth was not associated with any swelling or mobility. On radiographic examination, an under-obturated second mandibular premolar with the separated instrument in the middle third of the root canal was observed. The periapical tissues were normal and not associated with any radiolucency or widening(Figure 1).

Figure 1 Radiograph show in gunderobturated canal and fractured instrument in the middle third of root canal of the mandibular left second premolar.

A nonsurgical retreatment was planned, the patient was informed about the procedure and consent was taken. After administering local anesthesia, rubber dam isolation was done. The gutta-percha from the coronal third of the root canal was removed with Hedstroem-files (Dentsply International) and Gates-Glidden drills (Dentsply International) frequently irrigating with 3% sodium hypochlorite in the presence of GP solvent. The coronal portion of the broken instrument was visualized under a dental operating microscope (Carl Zeiss,Germany)at ×4 magnification. Attempts were made to navigate past the obstruction using K-files (sizes 08 and 10, Dentsply Maillefer). However, these efforts were unsuccessful as the obstruction was firmly embedded in the root canal's dentin. To access deeper areas around the separated file, a staging platform was prepared using a modified Gates Glidden drill (size 3, Dentsply Maillefer, Ballaigues, Switzerland). This platform helped to expose the file and the surrounding dentin, enabling the use of smaller ultrasonic tips to trough deeper around the separated instrument (Figure 2).

Figure 2) Removal of gutta-percha and the coronal portion of the fractured instrument is exposed.

The ultrasonic tip ET25 was activated to trephine dentin around the separated fragment.Intermittent canal irrigation was done with Normal saline to flush out debris and act as a coolant.Approximately 10 minutes later, the fragment became dislodged and exited the canal (Figure 3)

Figure 3) Fractured fragment of approximately 4.5mm in length

Immediately after post-operative radiographs were obtained to verify the complete removal of the fractured instrument (Figure 4). After determining the working length, cleaning and shaping were performed manually. Obturation was done using gutta-percha and AH26 sealer cement using lateral condensation technique (Figure 5). A metal-ceramic crown was placed as the definitive restoration (Figure 6).

Figure 4) Radiograph shows retrieved the instrument from the canal

Figure 5) complete obturation of the canal

Figure 6) 12-month follow up.

DISCUSSION

Endodontic instrument fractures can occur due to use of improper technique, excessive use or forceful manipulation within the canal. The success of endodontic treatment after an instrument fracture is significantly influenced by the extent of canal cleaning and shaping completed before the fracture occurred(7).

Various methods exist for removing separated instruments (SIs) from root canals, such as theEndo Extractor, Cancellier Extractor, Kit (SybronEndo), Masserann kit, and ultrasonic devices(3). While specialized instrument retrieval kits like Masserann, Terauchi, and Canal Finder exist, they can be costly and often require significant dentin removal, potentially weakening the root.Employing specialized ultrasonic tips in conjunction with a dental operating microscope and high-power magnification can effectively retrieve instruments while minimizing dentin loss(8,9).According to a study(10) the success rate of retrieval was 85.5% when the separated fragment was visible under a microscope, compared to 47.7% when it was not visible and no magnification was used.In the present case study the use of both ultrasonics and magnification resulted in successful retrieval.Instrument retrieval can be performed in either dry or wet conditions. While dry conditions offer improved visibility under a microscope, minimizing procedural errors, they also pose the risk of excessive heat generation from ultrasonic vibrations.

This heat can significantly increase the temperature of the root surface (by more than 10°C), potentially damaging the surrounding periodontal tissues(11). Furthermore, direct contact between the ultrasonic tip and the broken file can lead to secondary heat generation(11). To mitigate these risks, Normal saline irrigation was used during ultrasonic tip activation at the lowest power setting. This approach effectively improved the cleanliness of the root canal walls while minimizing heat-related complications. Several factors can influence the successful retrieval of fractured instruments from root canals. Instruments up to 4.6mm in length could be removed with ultrasonics solely(3).Higher success rates have been reported for fragments located above the curvature in the straighter portions of the canal than those located beyond curvature(12,13). The length of the fractured instrument in the present case study was 4.5mm and located in the straight portion of the root canal in the middle third of the root.While a separated instrument doesn't directly cause treatment failure, it indirectly contributes by hindering proper cleaning, shaping, and filling of the root canal. The primary objective, therefore, is to either remove the fractured instrument or bypass it to ensure thorough treatment of the entire root canal.

CONCLUSION

The best treatment for a separated instrument is prevention. However, retrieval of the fractured fragment is preferred before proceeding with treatment. Ultrasonic techniques combined with magnification offer a highly effective solution.

REFERENCES

[1]. Tzanetakis GN, Kontakiotis EG, Maurikou DV, Marzelou MP. Prevalence and Management of Instrument Fracture in the Postgraduate Endodontic Program at the Dental School of Athens: A Five-year Retrospective Clinical Study. J Endod. 2008 Jun;34(6):675–8.

[2]. Peters O. Current Challenges and Concepts in the Preparation of Root Canal Systems: A Review. J Endod. 2004 Aug;30(8):559–67.

[3]. Terauchi Y, Ali WT, Abielhassan MM. Present status and future directions: Removal of fractured instruments. Int Endod J. 2022 May;55(S3):685–709.

[4]. Cujé J, Bargholz C, Hülsmann M. The outcome of retained instrument removal in a specialist practice. Int Endod J. 2010 Jul;43(7):545–54.

[5]. Terauchi Y, O'Leary L, Kikuchi I, Asanagi M, Yoshioka T, Kobayashi C, et al. Evaluation of the Efficiency of a New File Removal System in Comparison With Two Conventional Systems. J Endod. 2007 May;33(5):585–8.

[6]. Terauchi Y, Sexton C, Bakland LK, Bogen G. Factors Affecting the Removal Time of Separated Instruments. J Endod. 2021 Aug;47(8):1245–52.

[7]. Chhina H. Ultrasonics: A Novel Approach for Retrieval of Separated Instruments. J Clin Diagn Res [Internet]. 2015 [cited 2024 Dec 29]; Available from: http://jcdr.net/article_fulltext.asp?issn=0973-709x&year=2015&volume=9&issue=1&page=ZD18&issn=0973-709x&id=5473

[8]. McGuigan MB, Louca C, Duncan HF. Clinical decision-making after endodontic instrument fracture. Br Dent J. 2013 Apr 27;214(8):395–400.

[9]. Gluskin AH, Ruddle CJ, Zinman EJ. Thermal injury through intraradicular heat transfer using ultrasonic devices. J Am Dent Assoc. 2005 Sep;136(9):1286–93.

[10]. Nevares G, Cunha RS, Zuolo ML, Da Silveira Bueno CE. Success Rates for Removing or Bypassing Fractured Instruments: A Prospective Clinical Study. J Endod. 2012 Apr;38(4):442–4.

[11]. Cohen S. , Hargreaves K. Pathway's of the Pulp,. 11th edition,. Kansas, MO, USA.: Elsevier,; 2016.
[12]. 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 Nov;32(11):1048–52.
[13]. Lopes HP, Moreira EJL, Nelson Elias C, Andriola De Almeida R, Neves MS. Cyclic Fatigue of Protaper Instruments. J Endod. 2007 Jan;33(1):55–7.