

Ultrasonic's Mediated Retrieval of a Broken Round Bur in the Root Canal of Lateral Incisor – A Case Report

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ABSTRACT

The preparation of the access cavity is the initial and most crucial step in the root canal procedure. This case report details the successful management of a clinical case involving an instrument fracture in the coronal third region of a tooth. Definitive management should rely on a comprehensive understanding of the success rates associated with each treatment option, carefully weighed against the potential risks of either removing or retaining the fractured file. A plethora of different methods have been employed to remove fractured instruments. In this case, the fracture bur was removed with the aid of ultrasonics.

Keywords: Access Cavity Preparation; Straight Line Access; Retrieval

INTRODUCTION

Access cavity preparation is one of the most challenging and intricate steps in endodontic treatment, yet it is also crucial to the overall success of the procedure. An appropriately prepared access cavity allows for essential procedures such as canal localization, measurement, chemo-mechanical preparation, and obturation. Inadequate cavity preparation can compromise root canal management, potentially causing instrument fractures, deviations from the original canal anatomy and other iatrogenic complications. These issues may result in persistent infection and ultimately lead to treatment failure (1). Minimally invasive access (MIA) cavities have recently been introduced as an alternative to traditional endodontic cavity (TEC) preparation. These cavity designs prioritize the preservation of dental tissue. Some studies suggest that this innovative approach significantly enhances tooth resistance to fracture and reduces the need for complex and costly prosthodontic restorations. (2) In some cases, the canal may become obstructed by metallic objects accidentally broken by the previous dentist, such as separated instruments or dental burs. A retained metallic obstruction can negatively affect the prognosis by hindering thorough cleaning and shaping of the root canal. The management of separated fragments can be handled through either surgical or nonsurgical endodontic treatment. (3)

The latter options involve attempting to bypass the fractured instrument, trying to remove it, or instrumenting and obturating the root canal system up to the level of the fragment. It is generally agreed that the best management approach is to remove the fractured instrument, allowing for adequate debridement of the root canal system. (4) This approach may be considered if the instrument fracture occurred during the early stages of instrumentation before the root canal system has been cleaned. Over the past several decades, numerous techniques, devices, instruments, and methods have been utilized. The ultrasonic technique works by generating ultrasonic vibrations that are transmitted to the fractured fragment, helping to loosen it and then move it out of the canal. However, like any technique, it may lead to unintended complications, especially if not used with caution. Despite this, it has proven to be an effective method, with recent reports indicating high success rates. (5) This case demonstrates the successful treatment of a root canal with a broken round bur in the coronal third, utilizing an orthograde ultrasonic approach.

CASE REPORT

A male patient aged 34 years reported to the department of conservative dentistry and endodontics with pain in upper front tooth region with a history of incomplete root canal treatment by a general dentist. The patient had a medical history that was not relevant to the current condition. Clinical examination showed that the tooth was sensitive to percussion. There was no mobility, and the periodontal probing was measured within normal limits (<3 mm). The tooth had a class 5 temporary restoration on the buccal aspect of tooth 22 [Figure 1]. Radiographic examination showed a radiopaque root canal filling material in the coronal third, suggestive of a separated round bur. The periapical

radiographic examination revealed a wide coronal chamber. Further removal of the broken instrument did not seem to perforate the root. [Figure 2]



Figure 1- Temporary class 5 restoration w.r.t 22



Figure 2- Round bur separated in coronal third region

Both clinical and radiographic findings indicated a diagnosis of incomplete previous endodontic treatment with symptomatic apical periodontitis.

After reviewing the treatment options with the patient, it was decided to proceed with nonsurgical endodontic retreatment. During the first appointment, after local anesthesia and rubber dam isolation, the temporary restoration was removed and it revealed that access cavity preparation was carried out from the cervical third region of tooth 21 suggestive of wrong approach, the access was further modified to attempt instrument retrieval. [Figure 3] A staging platform was created lateral to the separated instrument for placement of the ultrasonic tip. An ultrasonic tip (Satelec Acteon Group, Merignac, France) was inserted into the canal and activated for 1 minute without coolant. The canal was then irrigated with 2.5% sodium hypochlorite (NaOCl) to cool the working area and flush out debris. After multiple attempts, the instrument unwinded, loosened and got removed from the canal [Figure 4]. Canal was flushed with irrigants to remove the debris, working length was established and chemomechanical preparation was carried out with a combination of hand and rotary instruments followed by placement of calcium hydroxide as intracanal medicament. (Ultracall - Ultradent, Brazil)



Figure 3- Access cavity preparation from cervical third region of tooth

In the 2nd visit, the patient was asymptomatic with dry canals thus following the irrigation regime obturation was carried out using the cold lateral compaction technique and AH Plus sealer (Maillefer - Dentsply, Switzerland). [Figure

5].The access opening was sealed with a temporary restoration and the patient was referred to an operative specialist for the definitive restoration and a final radiograph was taken.

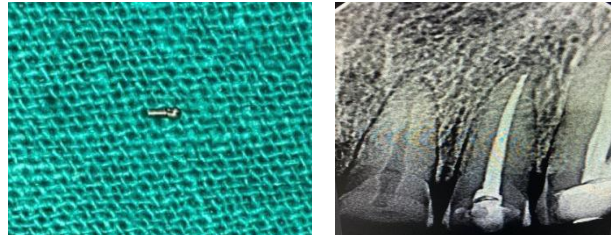


Figure 4- Bur retrieved from the canal Figure 5- obturation followed by permanent restoration

DISCUSSION

During root canal system preparation, various foreign objects, either intentionally or accidentally, may enter the root canals, introduced by either the dentist by not following the access cavity preparation guideline or the patient.(6) The occurrence of bur breakage within the root canal is reported to be quite rare in the literature.(3) A number of variables affect the effectiveness of non-surgical removal of fractured root canal instruments, including the fragment's length and placement, diameter, instrument fragment's impaction and friction on the canal wall, as well as the root canal's curvature.The location of the fractured instrument and the degree of root curvature significantly influence removal success. For fragments in the middle third or a curved section of the canal, the risk-to-benefit ratio of removal must be carefully considered. However, if the fragment is in the apical third or beyond a curvature, removal is often not feasible due to limited accessibility and visibility. Fragments located in the cervical third or the straight portion of the canal are typically easier to remove as described in the present case. (7) The precise cause of separation in this case is unknown.The bur might have been fractured due to the wrong site of access cavity preparation by the general dentist due to poor practice thereby limiting the straight-line access to the apical region.(3)Ultrasonic instruments are a valuable addition to the endodontic toolkit for removing foreign objects.

They are often effective and typically avoid the extensive removal of root structure required by other techniques used to extract objects and materials from root canal systems and thus were utilized in this case for removal of the bur from the coronal third region.(8)Ultrasonic systems are advised when fractured segments are visible, which typically occurs in straight canals, or when the fragment is located in the cervical third or before the curvature of the root canal. This limitation is regarded as a disadvantage of ultrasonic systems.Fragments located before the curvature of the canal have a 100% success rate in being retrieved.When fragments are positioned at or beyond the curvature, the success rate decreases to 60% and 31%, respectively.

The current study confirms the high success rate of removing fractured instruments when the fragments are situated in the straight or curved portions of the canal.Cold lateral compaction technique with gutta-percha cones as core filling material and sealer continues to be a commonly used technique. However, it can result in a non-homogeneous filling with spaces between the accessory cones and the canal walls, causing many lateral canals to remain unfilled and the sealer to be inadequately distributed. In this study, this technique was chosen because it allows for controlled placement of gutta-percha in the root canal, utilizes specific filling cement properties, and provides the operator with full control over the procedure. (7)

CONCLUSION

Based on the conditions of the current case report, the following conclusions can be drawn: -

- Instrument separation in the canal is one of the most challenging complications thus it must be avoided by following proper straight-line access and guidelines.
- Clinicians need to identify their limitations and consider referring cases that are beyond their ability and experience.
- The successful nonsurgical management of this case was attributed to the favorable location of the separated file, the relatively straight root canal system, and the patient's cooperation.

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